April 1, 1941

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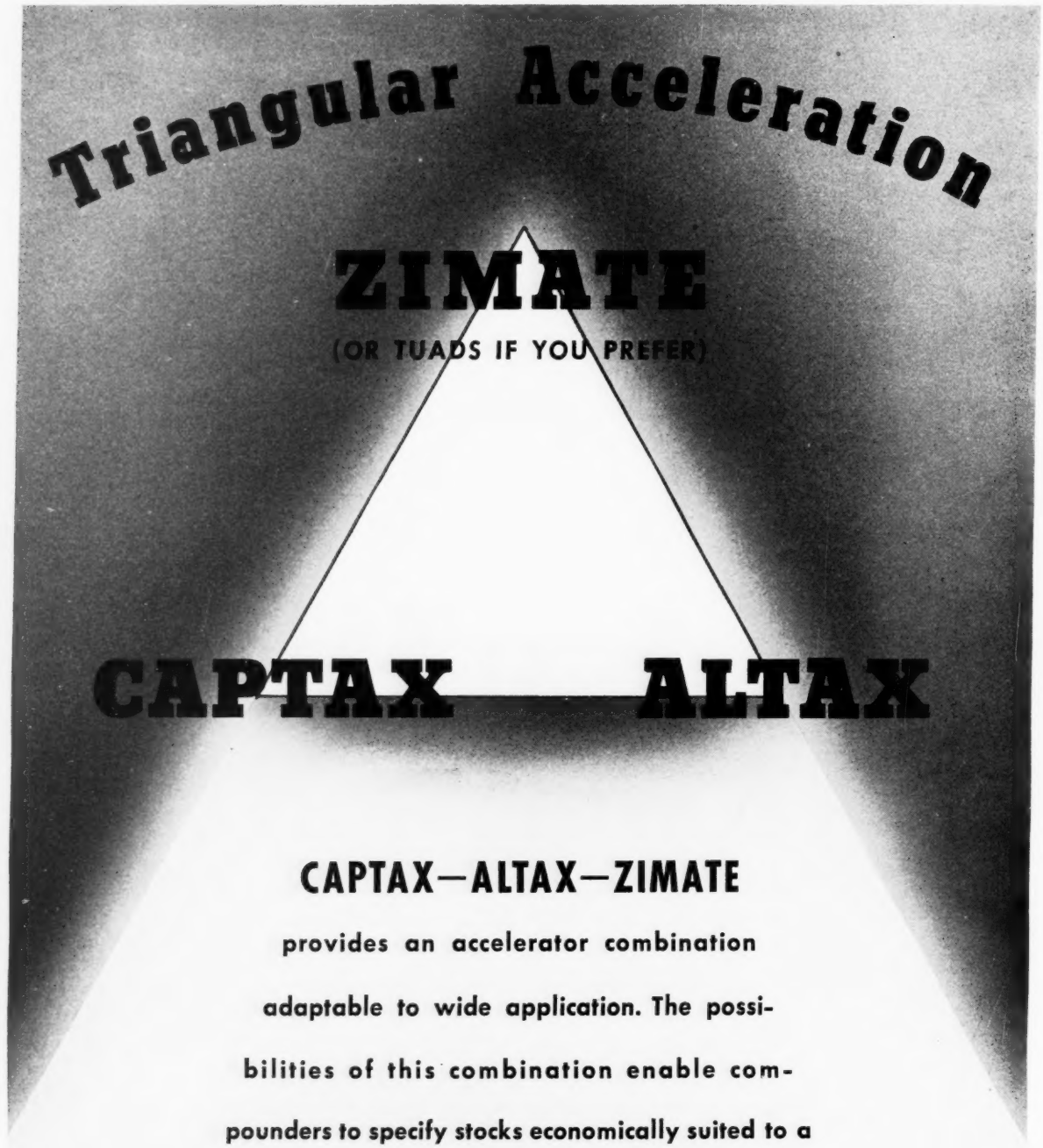

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INDIA RUBBER WORLD

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The Brazilian Rubber Industry

C. E. Nabuco de Araujo, Jr.[1]

AN IMPORTANT resolution was approved by the plenary of the Pan American Scientific Congress held in Washington in May, 1940. Such a resolution was of particular interest to Brazil as it was there recommended that all American tropical countries develop rubber plantations with a view to replacing eventually the product supplied by the eastern hemisphere. Such plantations could be organized through cooperation of private and governmental agencies, interested in solving the problem of rubber supplies. Following such recommendations the United States Government designated several technicians to coordinate the problem in South American countries, including Brazil.

In 1940, I was in Washington representing my country in the above mentioned Scientific Congress, and on my visits to several industrial and research organizations I had the opportunity to witness the generally keen interest regarding Brazil's possibilities for an immediate supply of rubber to the United States as well as for the Brazilian rubber industry.

Crude Rubber Supply

Some years ago the most important crude rubber supply was obtained from the Amazon region where several vegetable species yielding latex exist. However the main source is the wild tree known as *Hevea Basiliensis* and locally designated as *seringueiras*. This wild tree belongs to the family of *Euphorbiaceas* and is abundantly found in the States of Pará and Amazonas as well as in the Acre Territory, where an area of more than 4,000,000 square kilometers[2] containing about 300,000,000 trees could produce, when necessary, 600,000 tons of crude rubber. More optimistic data, based on studies carried out by Paul Le Cointe and cited in official statistics, made reference to a minimum of 600,000,000 trees which would permit a production of more than 1,200,000 metric tons of crude rubber. However, the maximum production obtained up to now was 42,410 metric tons in 1912, declining from this figure to the minimum of 8,681 metric tons in 1932. The Brazilian Government, considering that enoromous economic possibilities would attend organizing the rubber plantations, has since then insisted on the necessity of a methodical and technical production in order to meet the competition from East Indies rubber.

Cia. Brasileira de Artefactos de Borracha

Fig. 1. Exterior View of the Factory for Preparation of Rubber in the City of Manaos

In 1912, Brazilian production reached the maximum; while the East Indies, which started producing in 1900 with about four metric tons, replaced Brazil as the world's major source of crude rubber in 1913 when they produced 47,618 metric tons, against 39,370 metric tons obtained in our country.

Owing to the steps taken by the Government, rubber production in Brazil is regaining its previous position with a steady and progressive increase as follows:

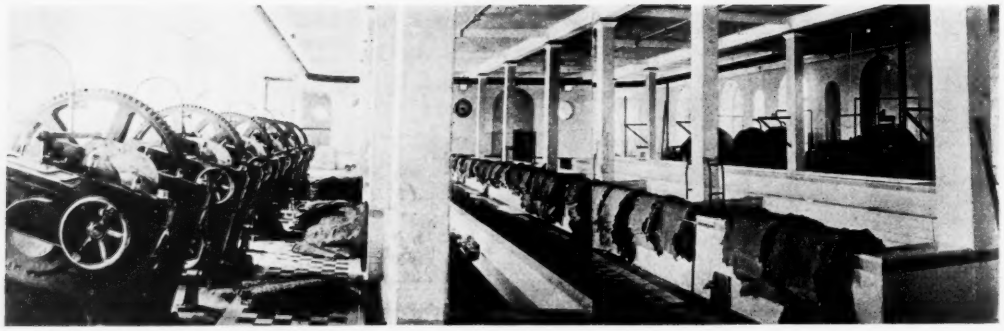
Year	Tons	Year	Tons
1934	12,104	1937	18,462
1935	16,288	1938	18,437
1936	17,581	1939	20,000 (estimated).

It is very well known that Brazilian rubber has some advantage, when compared with plantation rubber, mainly regarding elasticity, coefficient of rupture and plasticity; while it appears that there is no difference between the two rubbers in vulcanizing properties. Some manufacturers of rubber goods prefer the Brazilian raw material, alleging that plantation rubber lacks certain not well-defined qualities, which have been studied by various authors in comparative works carried out between the Brazilian Hard Fine Pará and the Imitation Ball Rubber.

Cooperating with the wishes of the Brazilian Govern-

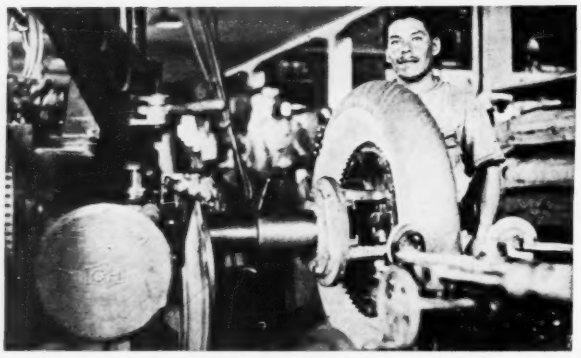
[1] Chemical and industrial analyst, Caixa Postal 970, Rio de Janeiro, Brazil.

[2] EDITOR'S NOTE: These statistics can only be interpreted as indicating physical existence and should not be construed as in any way related to availability in an economic or practical manner. These figures would represent an over-all area of 988,386,000 acres or 1,544,375 square miles (a plot almost 1,250 miles square) constituting almost half of Brazil with an average distribution of 0.3035 trees per acre and an annual production of 1.36 pounds of rubber per acre or 4.48 pounds per tree. Although some portions of the area are accessible and more concentrated, and can be harvested economically, these figures must be regarded as irrelevant to the question of emergency rubber supply.



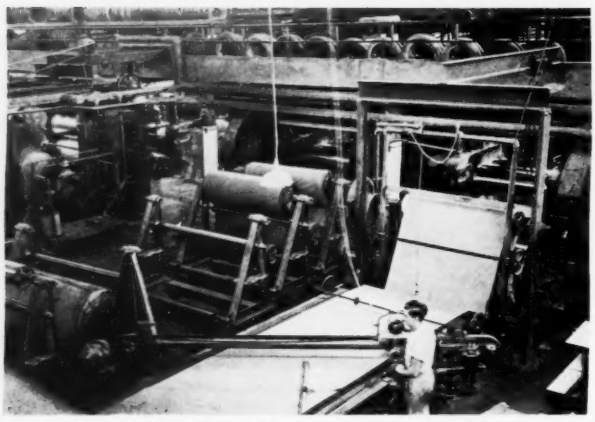
Cia. Brasileira de Artefactos de Borracha

Fig. 2. Interior View of the Factory for Preparation of Rubber in the City of Manaos



Cia. Brasileira de Artefactos de Borracha

Fig. 3. Building a Tire

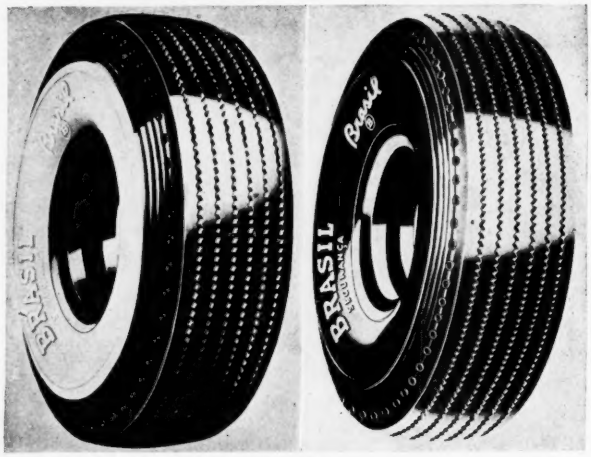


Cia. Brasileira de Artefactos de Borracha

Fig. 4. Interior View of a Tire Plant

ment, the Ford organization began technical plantation in Bôa Vista along the Tapajoz, more than 100 miles above the point to which the river was navigable by steamers of regular tonnage. The first results from the Bôa Vista plantation were not satisfactory, and, as a consequence, it was necessary to start new plantations in Belterra, located 27 miles from the entrance of the Tapajoz River. In Belterra there are about 2,000,000 trees, and it was estimated that in the coming two years the trees under production in the two districts of Bôa Vista and Belterra will produce from ten to twelve tons of crude rubber of good quality.

Besides the Ford plantation, a few others, operating on



Cia. Brasileira de Artefactos de Borracha

Fig. 5. De Luxe Type *(Left)* and Regular Type *(Right)* of a "Brasil" Tire

a minor scale, are located at several points in the Amazon region, such as: Miry, Rio Branco, Japacary, Sumaúma, Igarapé-Assú, Gurupá, Cacoal Imperial, Bôa Fé, and Furo do Ramos. On all of these plantations it was verified that by adopting technical and scientific control it will be possible to obtain better rubber than that now obtained from the East Indies plantations at a lower cost.

Under the circumstances the rubber industry in Brazil tends to develop in a very promising way, not only on account of the large output of local raw material, but also owing to the steady increase in consumption of local manufactured rubber goods.

In 1736, La Condamine wrote that Brazilian Indians used latex in water-proofing cloth and other materials. However several attempts to utilize latex following the methods employed by the natives failed and had to be abandoned, owing to the instability of fresh natural latex. But when the preservation of latex became possible and its concentration and some of the fundamentals of its chemistry and reactivity became more fully known, the interest toward the use of latex grew steadily.

Production of Rubber Products

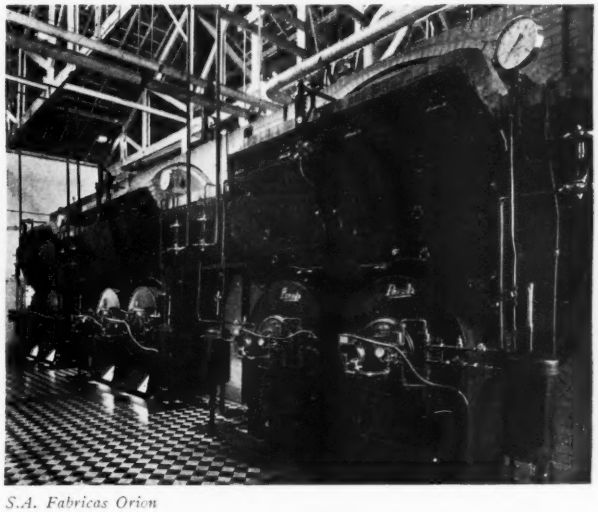
In 1939 there were in Brazil 86 factories employing about 7,000 specialized workers, manufacturing at an annual output of more than 75 thousand contos de réis (approximately 3,750,000 U. S. dollars). The consumption of raw rubber increased sixfold in 25 years, and the

S.A. Fabricas Orion

Fig. 6. Display in the XII Internation Exposition at Rio de Janeiro (1939) of Rubber Goods by S.A. Fabricas Orion

S.A. Fabricas Orion

Fig. 7. S.A. Fabricas Orion Plant at Sao Paulo



S.A. Fabricas Orion

Fig. 8. Boilers Using Fuel Oil in the Plant of S.A. Fabricas Orion

1940 consumption was estimated at 6,000 tons. The following products are now being manufactured locally: tires, inner tubes, waterproof coats, carpets, hose tubes, hot water bottles, sheets, runners, bulbs for motor horns, and many other articles.

As I have previously mentioned, the first rubber goods produced in Brazil were recorded in 1736, but only recently the rubber industry began to develop. In the State of Pará four factories are operating with an annual output of 52,000 tires and 150,000 inner tubes. Two factories belonging to S.A. Bitar Irmãos, the first to produce tires in the rubber habitat, have a monthly capacity of 2,000 tires and 60,000 inner tubes besides other rubber manufactured goods. The other two factories belonging to Francisco Chamié and Felippe Farah have a combined production of 28,000 tires and 90,000 inner tubes. They also manufacture other rubber goods.

In the Federal District the Companhia Brasileira de Artefactos de Borracha is the most important plant. Having been producers of rubber goods, for many years, this concern erected in 1935 one of the most modern plants for tire production with the help of Seiberling interests. At the present the company is 100% Brazilian and possesses two other factories: one in the city of Manáos (State of Amazonas), where five tons of crude rubber are daily prepared (Figures 1 and 2); and the other located in Marzagão, State of Minas Geraes, which was recently built and is producing cord fabric from Brazilian cotton. Tests carried out with the national cord fabric proved it to be superior, in every respect, to any American or English product imported up to now. The production of tires at the factory in Rio de Janeiro (Figures 3 and 4) was

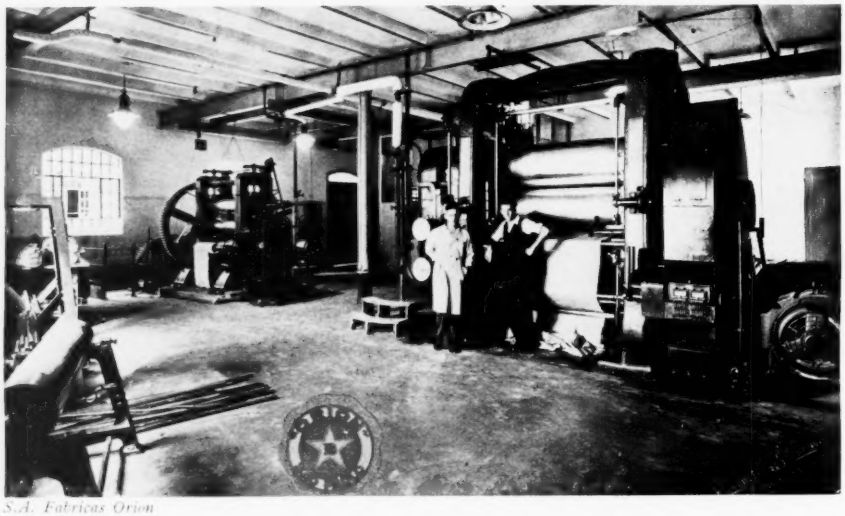
S.A. Fabricas Orion

Fig. 9. Mills for Washing Crude Rubber

operating by the end of the nineteenth century and produces a wide variety of rubber goods, as can be seen by the exhibit shown in Figure 6. The S.A. Fabricas Orion has a very well-equipped plant (Figure 7) built in one of the suburbs of the City of São Paulo, where offices as well as analytical and research laboratories were recently modernized. During 1939 about 755 tons of hard rubber or ebonite products were manufactured. Besides, tires and inner tubes, hose tubes, hot water bottles and bags, toy balloons, heels for shoes, rubber belting, waterproof fabrics, rubber pulverizers, combs, battery cases, cylinder coatings, rubber rulers, rubber preservatives and several articles for surgical purposes are also manufactured by Orion. Figures 8, 9, and 10 show internal views of this modern and well-equipped factory.

The Italian concern, Pirelli S.A., is another plant long established at São Paulo. The factory, located at Capuava,

Fig. 10. Calenders for Rubber Sheets



S.A. Fabricas Orion

Pirelli S.A.

Fig. 11. Pirelli S.A. Plant at Sao Paulo

at the following rate: 1936—29,409; 1937—62,553; 1938—64,630; 1939—74,792; 1940—96,000 (estimated). During 1939 besides 74,792 tires the factory produced 64,745 inner tubes, consuming 947,891 kilos of rubber. During 1940 the production of inner tubes amounted to more than 85,000, and the rubber used for both tires and tubes surpassed 1,200 tons. The plant is now being enlarged to produce from 180,000 to 200,000 tires yearly. The area occupied by the several buildings is around 7,500 square meters, where approximately 170 workers of which 10% are foreigners, developed their specialized activities. The trademarked tire "Brasil" is a very well-known product (Figure 5).

Although some small rubber goods factories are also located in Rio de Janeiro, the most important center of rubber industry is found in the State of São Paulo. The plants of the S.A. Fabricas Orion and Pirelli S.A. have been in operation for a long time. The first began was built in an area of 39,000 square meters, where 1,200 laborers and 180 office clerks work for the production of

(*Continued on page* 50)

Cia. Goodyear do Brasil

Fig. 12. Goodyear Plant at Sao Paulo

Positively Charged Latex

B. V. Coplan,[1] S. S. Rogers,[2] and L. A. Hansen[3]

LATEX, like many other colloidal systems, owes its stability to a large extent to the electrical charge carried by each particle in suspension. One possible explanation[4] of how the particles become charged is that the protein adsorbed on the rubber hydrocarbon is capable of ionizing to a slight extent both as an acid and as a base much in the same manner as do amino acids. In a highly basic solution the rubber particle acquires a negative charge; while in acid solutions the charge is positive. At some stage between strongly acid and strongly basic solutions the ionization of the adsorbed protein layer would be as much acidic as basic, and the particle would have no net charge. This is known as the isoelectric point and has been found to be at a pH of 4.2.[5] At or near the isoelectric point the latex is very unstable and coagulates rapidly. The charge carried by the particle may, of course, also be due to adsorption of ions from solution.

The latex particles are normally negatively charged, but the sign of the charge can be reversed by the addition of acid,[6] by the presence of polyvalent cations,[7] and more recently it has been shown that cationic soaps[8] may reverse the charge. In a cationic soap the positive ion is a long chain, and the negative ion is a halide, sulphate, etc. The hydrophilic group attached to the long chain of carbon atoms is a quaternary ammonium, sulphonium, or phosphonium group.

The authors felt that, because positively charged latex seems to have some commercial possibilities, it would be of interest to attempt to prepare latex suspensions of reversed charge of higher concentrations than those used by Blow,[8] which were apparently around 5%.

The latex used was a centrifugally concentrated type containing 63% total solids and 0.55% ammonia. Of the cationic soaps studied the following seemed to show the most promise (these were of commercial grade):

Cetyl pyridinium bromide
(which we shall refer to as) A
Cetyl trimethylammonium bromide
(which we shall refer to as) B
Diethyl-amino-ethyl-stearyl amidacetate
(which we shall refer to as) C

By trial it was found that about 5% on the dry rubber content of the latex was a satisfactory amount of cationic soap to use. Less than this amount did not satisfactorily reverse the charge; while more than this had no additional beneficial effect.

The charge of the particles was determined by using platinum electrodes attached to a source of direct current and noting the direction of migration with an ultra-microscope or observing on which electrode the rubber deposited.

A standard procedure was adopted to determine the relative values of these soaps for the latex used. One hundred and twenty grams of 63% latex were diluted with 310 grams of water. This diluted latex was poured into 80 grams of 5% cationic soap solution. Sixty cubic centimeters of the resulting solution were then taken as a standard amount. Varying quantities of 5% acetic acid were added to the standard solutions, and the pH of each was determined with a glass electrode. After 24 hours the samples were examined, and the pH range in which the solution did not cream was noted. The results are as shown in the following table.

SOAP A.....pH of a 5% solution = 1.8

cc. of acid added (5%)	pH	Remarks
0	9.7	Creamed-paste on top
2	9.0	Creamed-paste on top
2.75	7.8	Creamed-paste on top
3	6.6	Slight creaming fluid on top
3.75	6.13	Very slight creaming-fluid on top
4	6.0	Very slight creaming-fluid on top
4.25	5.8	No creaming
5	5.2	No creaming
7	4.7	No creaming
10	4.4	No creaming

SOAP B.....pH of a 2% solution = 3.1

0	9.7	Creamed-paste on top
1	9.5	Creamed-paste on top
2	8.9	Creamed-paste on top
3	7.7	Creamed-paste on top
4	5.7	Creamed-fluid on top
5	4.7	No creaming
10	4.4	No creaming

SOAP C.....pH of a 5% solution = 2.5

0	9.8	Creamed-paste on top
3	7.8	Creamed-paste on top
4	5.8	Creamed-paste on top
5	5.2	Creamed-paste on top
6	4.9	Creamed-fluid on top
7	4.8	Creamed-fluid on top
10	4.6	Creamed-fluid on top

Soap B was used as a 2% solution because at a concentration of 5% it was too viscous to handle easily. This dilution was compensated for in preparing the standard samples.

The terms "paste on top" and "fluid on top" in the above tables are merely relative. They serve as a crude method of describing the nature of the top layer which results when creaming occurs. Since the technique of preparing the samples was found to have an important effect upon the results, no effort was made to establish more closely the pH at which creaming occurred. It was felt that there was no justification for attempting more accurate values since change in the kind of latex, method of mixing, or concentration of reagents would affect the values to a greater extent than the limits already determined.

From the table it can be seen that for Soap A a pH of six is the limit and for B the limit is at a pH of five. With Soap C the latex creamed at all values of pH tried.

To some solutions which had creamed during the 24-hour period, acetic acid was added to bring the pH down to values at which freshly prepared solutions were stable. In many cases it was found that the solutions did not cream again.

It was found that adding a fairly concentrated latex (about 30% dry rubber, or greater) to Soap A, utilizing about 5% soap on the rubber, caused gelation that resulted in a pasty mass resembling soft putty. Adding enough acid to lower the pH below six caused the mass to become as fluid as ordinary latex with no tendency to cream. This change was due to a change in pH since adding water did not produce a stable solution. The concentration of rubber was gradually increased until stable suspensions of 30% dry rubber content were obtained. It is felt that with more efficient stirring stable positively

(*Continued on page* 50)

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[2] Present address, United States Rubber Co., Passaic, N. J.
[3] Assistant professor of colloid chemistry, Department of Chemistry, Rensselaer Polytechnic Institute.
[4] Davis and Blake, "Chemistry and Technology of Rubber", Reinhold Publishing Corp., New York, 1937, p. 606.
[5] A. R. Kemp and W. G. Straitiff, *J. Phys. Chem.*, 44, 788 (1940).
[6] Davis and Blake, *Ibid*, p. 607.
[7] Flint, "Chemistry and Technology of Rubber Latex", D. Van Nostrand Co., New York, 1938, p. 360.
[8] C. M. Blow, *J. Soc. Chem. Ind.*, 57, 116 (1938).

Gasoline Diffusion Resistance of "Thiokol"[1] Type "F"

S. M. Martin, Jr.[2]

THE solvent resistant properties and low swell characteristics of the "Thiokol" synthetic rubbers are well known to the rubber technologist. It is also known that these rubbers are highly resistant to permeation by solvents. Gasoline, and benzol blended gasolines, do not diffuse into and through them to any great extent.

The permeation of rubber and synthetic rubbers by fixed gases, such as hydrogen and helium, has been the subject of considerable study. Such information has a bearing on the construction of dirigibles, blimps, observation balloons, and barrage balloons. T. P. Sager[3] shows that the ratio of permeability to hydrogen for "Thiokol" Type "DX" (now Type "F") compared to rubber at 25° F. is 1 to 12.

Recently the diffusion of gasoline and oil through solvent resisting synthetic rubbers has become of general interest. The information generally sought is the amount of gasoline that will diffuse through a given area in a given time.

Diffusion Test Methods

Since the losses are expressed in terms of unit area, the total area of the test piece is of little importance except as it affects the accuracy of the weighings or measurements. A simple apparatus that has been found satisfactory for use with cured sheets is made from a screw cap Mason fruit jar, equipped with a Kerr screw cap. The metal disk in the top of the cap is removed. In its place is inserted a disk cut from 16-mesh wire screening and a disk cut from the piece of rubber to be tested. The jar is filled with the desired amount of gasoline, the cap assembly screwed on, and the jar weighed. The jar is hung or suspended in an inverted position in a constant-temperature room and weighed at intervals. The wire screening serves to protect the test piece against sagging or stretching under the weight of the gasoline.

Where weighings are to be made on an analytical balance, the fruit jar may be too large. A similar container can be made from a six-ounce wide mouth bottle equipped with a metal screw cap. The center of the cap can be cut out. This leaves a ring with an opening 1¾ inches in diameter. This ring, when fitted with the wire disk and test piece, can be screwed on the bottle to make a tight seal. Where coated fabrics are tested, it may be necessary to bolt the test pieces between metal flanges attached to a metal cup.

The data shown in this report were obtained with both types of apparatus. The jars were used for cured sheets, and metal cups with flanges for testing the coated fabrics. In measuring diffusion losses 150 cubic centimeters of liquid were put in the apparatus; this was hung in a constant temperature room at 75 to 78° F. and weighed at intervals on a scale accurate to 0.02-gram. Weights were recorded to the nearest 0.1 gram. All measurements were made in triplicate, and data averaged.

Tests have indicated that the volume of gasoline used per unit of area can be varied widely without affecting the diffusion rate. In cases where the diffusion is so high as to change the composition of the gasoline through the loss of the more diffusible constituents, the rate may be affected. The data in some cases show zero diffusion. This means that the loss in weight of the container was so slight that it could not be detected under the conditions of the experiment.

[1] Trade mark registered United States Patent Office.
[2] Thiokol Corp., Trenton, N. J.
[3] *J. Research National Bur. Standards*, 25, 309 (1940), R P 1327.

Diffusion Tests on Sheets

As can be seen from the data given here, the diffusion of gasoline and gasoline containing appreciable amounts of aromatics through "Thiokol" Type "F" is exceedingly low. The formula of the "Thiokol" Type "F" stock used was selected as representative of compounds that are in regular factory production.

In order to obtain certain special characteristics it may be desirable to blend "Thiokol" Type "F" with other synthetic rubbers.

Data on the diffusion of gasoline through a few such blends, along with the diffusion data for the "Thiokol" Type "F" stock are shown. While the data given are for blends of "Thiokol" Type "F", with only one other type of synthetic rubber, laboratory tests indicate that the principle of blending to obtain special characteristics can be applied to the other oil resisting synthetic rubbers without materially increasing diffusion.

The data given here were obtained on the following:

Stock No. 1—A "Thiokol" Type "F" compound.

Stock No. 2—A blend consisting of 100 parts of "Thiokol" Type "F" and 20 parts of another synthetic rubber (by weight of crude).

Stock No. 3—A blend consisting of 100 parts of "Thiokol" Type "F" and 60 parts of the other synthetic rubber.

Stock No. 4—A stock solely of the synthetic rubber used for blending with the "Thiokol" Type "F" in Stocks No. 2 and 3. This synthetic rubber stock was a conventional type of compound, but may or may not be typical of this particular synthetic for low permeability.

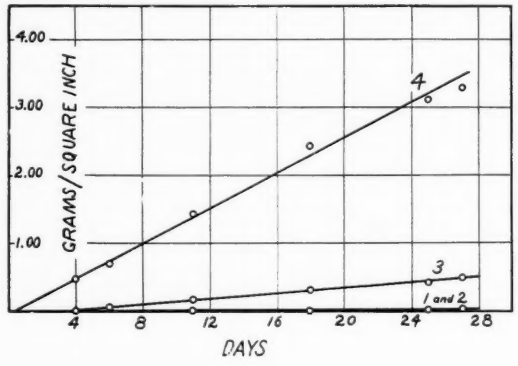
In Figure 1 is plotted the diffusion of a commercial grade of 73 octane non-leaded aviation gasoline through these stocks.

Similar data obtained with a number of different aviation gasolines show approximately the same differences between the stocks, but the actual rate varies with different gasolines. This is no doubt due to variations in composition of the gasolines, especially the aromatic content.

The cumulative diffusion loss of a 100 octane leaded aviation gasoline through these same stocks are shown in

TABLE 1. TOTAL DIFFUSION LOSS

Stock No.	Sheet Thickness Inch	Time in Days							
		1	2	4	6	8	10	12	14
1	.062	.00	.00	.01	.01	.01	.01	.01	.01
2	.062	.00	.00	.01	.01	.01	.01	.01	.01
3	.062	.01	.01	.02	.02	.02	.02	.04	.04
4	.062	.00	.01	.15	.27	.37	.47	.60	.70



Stocks

1. Stock No. 1 "Thiokol F"
2. Stock No. 2
3. Stock No. 3
4. Stock No. 4

Fig. 1. Diffusion 73 Octane Aviation Gasoline through Stocks Nos. 1 through 4—Sheets 0.062-Inch Thick; Temperature 75° F.

Table 1. The tests were run at 75° F., and the losses expressed as grams per square inch.

The above data, when compared with those in Figure 1, show that 100 octane gasoline does not diffuse through certain of these stocks so rapidly as does 73 octane gasoline. High octane aviation fuels contain a minimum of aromatics, and this probably accounts for the difference in behavior of the two gasolines. While neither fuel was checked for its aromatic content, the 73 octane gasoline was in no sense a high aromatic fuel.

Since it is possible that aviation fuels may be blended with aromatics, these same stocks have been tested in a blend made up as follows:

AROMATIC BLEND

73 Octane aviation gasoline	70%
Benzine	10
Toluene	10
Xylene	10

The diffusion of this blended gasoline through the series of stocks under test is shown in Figure 2, which illustrates the following points:

1. The diffusion of gasoline through the blends is not proportional to the volume ratio of the crude synthetics used in the blends. For example, Stock No. 2, which is a 100/20 blend shows exceedingly low permeability.

2. The "Thiokol" Type "F" stock is practically impermeable to straight aviation gasoline and to the aromatic blend.

The data shown on Figures 1 and 2 and in Table 1 were all obtained on sheets approximately .062-inch ($\frac{1}{16}$-inch) thick. As thickness is another variable that has an effect on diffusion rates, sheets of different thicknesses were tested using 73 octane aviation gasoline. The cumulative losses of gasoline through the various sheets are shown in Table 2. The tests were run at 75° F. and the losses are expressed in grams per square inch.

TABLE 2. TOTAL DIFFUSION LOSS

Stock No.	Sheet Thickness Inch	Time in Days 3	5	7	12	14	18
1	.032	.00	.00	.00	.00	.02	..
.....	.062	.00	.00	.00	.00	.00	.00
2	.029	.02	.02	.05	.08	.11	..
.....	.062	.00	.00	.00	.00	.00	.00
3	.032	.05	.09	.14	.24	.29	..
.....	.062	.00	.04	.07	.19	.21	.30
4	.031	.54	.93	1.38	2.38	2.72	3.58
.....	.048	.33	.62	.92	1.62	1.87	2.46
.....	.073	.12	.25	.45	.92	1.00	1.50
.....	.134	.02	.16	.31	.71	.88	1.18

Further data on the low diffusion of gasoline through relatively thin layers of "Thiokol" Type "F" are given in the section dealing with the diffusion through coated fabrics.

Diffusion Tests on Coated Fabrics

The above data were obtained on sheets of the synthetic rubber stocks. The combinations of "Thiokol" Type "F" with the other synthetic rubber were obtained by blending during mixing. Other combinations of synthetics are possible through the separate layers used on impregnated and coated fabrics. Comparative tests for permeability were made on two-ply fabric with an inner layer and a coating on each outer surface. The coated fabrics tested were:

Test A—Coated with "Thiokol" Type "F" stock throughout.

Test B—Coated with another synthetic throughout.

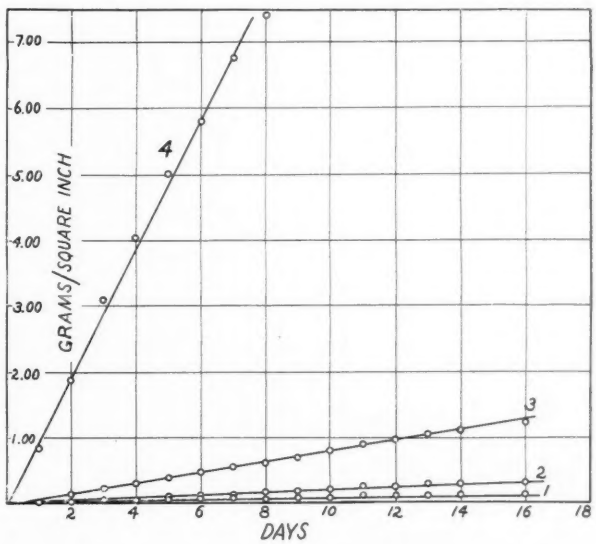
Test C—The synthetic rubber between the plies was a "Thiokol" Type "F" stock. The outside surfaces were coated with another type of synthetic rubber.

The cumulative diffusion of 73 octane aviation gasoline through these fabrics, over a 14-day period, is shown in:

TABLE 3. TOTAL DIFFUSION LOSS—GMS./SQ. IN.

Type	Time in Days 1	7	14
A	.00	0.02	0.03
B	.45	3.08	5.35
C	.01	0.03	0.06

These samples were taken from commercial runs, and the exact composition of the synthetic rubber stocks was not revealed. The total thickness in all cases was .016-inch. In Test C the "Thiokol" Type "F" stock represented a high percentage by weight of the synthetic rubber stocks used. The diffusion experienced in Test A and Test C is exceedingly low. It is interesting to note that the combination of synthetics in Test C shows the same low diffusion of the "Thiokol" Type "F" stock used between the plies.



Stocks

1. Stock No. 1 "Thiokol F"
2. Stock No. 2
3. Stock No. 3
4. Stock No. 4

Composition of Blend

73 Octane Aviation Gasoline	70%
Benzene	10%
Toluene	10%
Xylene	10%

Fig. 2. Diffusion Aromatic Blend through Stocks Nos. 1 through 4—Sheets 0.062-Inch Thick; Temperature 75° F.

Distributers' Tire Stocks in the United States, January 1, 1941[1]

E. G. Holt[2]

THE results of the sixteenth quarterly survey of retail stocks of automobile tires and inner tubes, as of January 1, 1941, are shown below in comparison with summary data for preceding quarterly surveys. The bases and methods described in earlier reports have been used in calculating the stocks held by the following three groups of distributers: 1. Individual dealers, including large and small retailers. 2. Distributers through oil and other company chains. 3. Manufacturer-owned-and-operated stores, mail-order houses, and other important retail chains.

Distributers' Stocks by Surveys

Total distributers' stocks of motor vehicle casings are estimated at 7,270,000 on January 1, 1941, practically identical with the revised figures for October 1, 1940, but a reduction of 789,000 during the last half of 1940. Individual dealers reported increased stocks; while stocks of oil companies and other mass distributers were lower. A slight increase in casings stocks has been typical on January 1, compared with October 1, in the past three years, and the current increase is nominal considered in relation to the replacement sales rate. Stocks of casings on January 1, 1941, were 260,000 above those at the beginning of 1940, and appreciably higher than on January 1, 1939.

Details of casing stocks during recent quarters are shown in the following table:

[Thousands of Casings]

	Dealers	Oil Companies	Other	Total
1941				
January 1	3,248	1,772	2,250	7,270
1940				
October 1	3,139	1,790	2,341	7,270
July 1	3,281	1,796	*2,982	*8,059
April 1	3,312	1,755	2,482	7,549
January 1	2,996	2,000	2,014	7,010
1939				
October 1	3,122	1,487	2,250	6,859
July 1	2,900	1,646	2,356	6,902
April 1	3,018	1,725	2,074	6,817
January 1	2,735	1,838	1,920	6,493
1938				
October 1	2,588	1,840	1,990	6,418
July 1	2,767	2,079	2,163	7,009
April 1	3,007	1,869	2,051	6,927
January 1	3,015	2,115	1,920	7,050
1937				
October 1	3,000	1,774	2,289	7,063
July 1	3,363	1,996	2,299	7,658
April 1	3,835	1,853	2,304	7,992
1936				
Estimated	3,500	1,650	2,000	7,150

* Revised

The total distributers' inventory of inner tubes increased normally during the final quarter of 1940; the increase of 102,000 during the period compared with 94,000 a year earlier and 137,000 in the final quarter of 1938. The increase was 261,000 in dealers' stocks, with a 40,000 addition to oil-company holdings, and a reduction of 199,000 in tube stocks of other mass distributers. Current stocks of inner tubes, except for October 1, 1940, are the lowest in recent years.

Details of inner tube stocks are shown in the following:

[Thousands of Inner Tubes]

	Dealers	Oil Companies	Other	Total
1941				
January 1	3,290	1,541	1,555	6,386
1940				
October 1	3,029	1,501	1,754	6,284
July 1	3,486	1,446	*1,799	*6,731
April 1	3,551	1,487	1,821	6,859
January 1	3,310	1,671	1,532	6,513
1939				
October 1	3,220	1,406	1,793	6,419
July 1	3,206	1,393	1,829	6,428
April 1	3,460	1,626	1,588	6,674
January 1	3,445	1,733	1,599	6,777
1938				
October 1	3,132	1,781	1,727	6,640
July 1	3,560	1,805	1,786	7,151
April 1	4,021	1,918	1,728	7,667
January 1	3,547	2,127	1,717	7,391

* Revised.

Dealers' Reported Stocks

Stocks reported by 1,276 individual dealers for 1,817 stores in the current survey are compared below with details for the same firms on October 1, 1940, when they reported 1,984 stores. The small dealers reported reduced stocks; while those with above 200 casings report increases (average) in both casings and tubes.

			October 1, 1940	
Casings	Dealers	Stores	Casings	Tubes
Under 200	822	934	71,308	90,325
200 - 500	265	399	77,081	76,761
Over 500	189	651	215,811	195,052
Total	1,276	1,984	364,200	362,138
Index Number	....	....	89.7	....

			January 1, 1941	
Casings	Dealers	Stores	Casings	Tubes
Under 200	822	916	66,784	89,958
200 - 500	265	371	79,578	80,665
Over 500	189	530	230,448	212,187
Total	1,276	1,817	376,810	382,810
Other January	214	267	93,622	93,880
Total January	1,490	2,084	470,432	476,609
Index Numbers	....	....	92.8	94.0

Stocks of Special Dealer Groups

Stocks reported by 98 New York dealers with 125 stores in the current survey aggregated 48,898 casings and 57,365 tubes, returns comparable with October 1 indicating increases during the quarter. Reports for dealers handling tires of particular make were also compiled in three instances, and these reports likewise recorded increases in stocks of both tubes and casings in the fourth quarter, except that with one make a decline in stocks of casings was noted. The foregoing table includes data mentioned in this paragraph.

Oil-Company Distributers' Stocks

Comparative returns were received from 34 firms in

(*Continued on page 44*)

[1] *Industrial Reference Service*, Feb., 1941, No. 14, U. S. Department of Commerce, Washington, D. C.

[2] Chief, Leather and Rubber Division.

Development and Standardization of Tire Valves

Selden T. Williams[1]

TIRE valve practice has been a world-wide standard for so long that tire dealers do not appreciate the confusion that would result should a break in standards arise. True, modifications in the valve housings are frequent and regulated by The Tire & Rim Association and its international affiliates to suit the changing needs of tires, rims, and vehicle advancement. But the replaceable valve inside, with its cap and all gaging and inflating accessories conform to the standards established more than 40 years ago. The tire valve inside or core of today will fit the housings of 1898 as well as the present standard valve.

Early tire valves, prior to 1898, generally did not feature replaceable cores or check units, and the whole valve had to be replaced in case of leakage. This was not always easy as the stems were tied into the tube with cord.

The first replaceable valve inside of the present type comprised the familiar threaded and swiveled plug with a rubber cone, and an annular metal seat, against which a rubber washer was pressed by means of a spring. Removal of the inside by a screw driver incorporated in the cap is possible for cleaning, deflation, inspection, or replacement. And the same unit is used on bicycles, passenger cars, trucks and airplanes.

Unlike many items, the changes in the valve inside or core through the years have been more real than apparent. The rubber seat washer has been made resistant to conditions ordinarily encountered, and the inflation rate has been doubled by streamlining the design. Weaknesses have been eliminated or reduced to a negligible factor. But the basic replaceable unit valve mechanism, with air tight cap has endured.

Motor-car tire valves in this country were of the replaceable type from the first, as United States tire manufacturers standardized for production and service reasons. Canada followed suit; but England and Continental Europe went their own ways for many years. Valves of the "dolly" pin type were used in Europe, and generally the valves were two-piece.

The World War, however, brought the convenience and security of the standard type of replaceable valve to the attention of English and Continental motor-car users, and in September, 1923, the English engineers and subsequently the Continental engineers standardized on the American valve. This action established the only world-wide standard in the history of the automotive industry and has permitted the universal availability of interchangeable necessary parts and servicing facilities.

From then on a diversity of sizes, lengths, and forms of housings was developed to meet the changing tire and rim sizes, increase of brake drum size, and reduction of rim diameters. By 1930 truck and bus valves, housings, or stems, were of all kinds and descriptions—straight, single bent, double bent, and all graduations of length. (Simplification of standards by The Tire & Rim Association was the next major step.) New standards were developed, comprising a convertible valve series, hand bendable. Now for trucks and buses a basic series of five stems, supplied straight or single bent according to the tube size, is bent in the field (to a chart setting and by a hand bending tool provided) to fit the rim and mounting requirements. This simplification reduces the tube and valve combinations so that a small tube stock can provide universal service.

Since 1930 the only change in the large tire valve housings has been to encase the head of the housing in rubber and vulcanize it to the tube. Formerly valves were bolted in with a nut and washer.

In the passenger-car field the American adoption of the English drop center rim permitted a simplification of the passenger series. The side valve stem hole and thin metal rim permitted the use of short straight valves. Standards of valve insides, cores, and housings were unchanged; and the housing unit was vulcanized in a rubber cot—not differing greatly from the first rubber cot used on bicycle

Fig. 3. Valves of 1900 and 1941

(Left) In 1900 came the 609 housing, with the unit construction core and screw driver cap. This is with real, but not readily apparent changes, the valve set up today

(Right) The valve housing cap and core of today as used with minor modifications in bicycles and passenger cars

[1]Factory manager, A. Schrader's Son, Division of Scovill Mfg. Co., Inc., Brooklyn, N. Y.

Fig. 1. Original Woods Cycle Valve—Period 1892 to Date In England and on the Continent

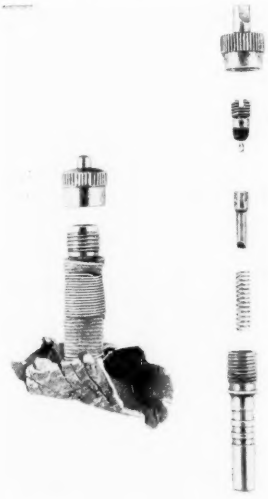


Fig. 2. Cycle Valves of 1893 and 1898

(Left) The cycle valve of 1893 and later, mounted in its fabric and rubber cot preparatory to cementing to the bicycle tube. If the core housing were cured instead of wired into the cot, it would be almost identical with today's valve

(Right) In 1898, the first top repair valve of the spring check type. The parts come separately, but are replaceable without disturbing the housing or tube. The housing will take the valve core and cap of today. It is Schrader No. 8 Valve (Ex12)

Fig. 4. Schrader Conversion for Michelin Motor Valve 1904-1910; Note that Michelin Dolly Pin Could Be Used with This Core Housing if Desired

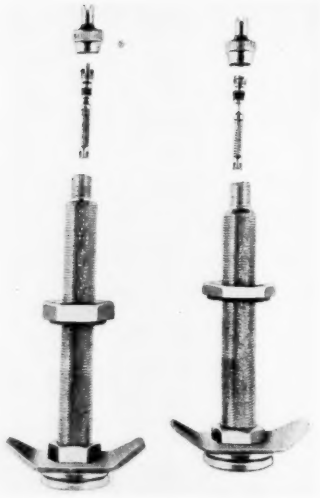


Fig. 5. Schrader Motor Valves as Used in England and on the Continent, 1918-1933

tires almost 50 years ago—and so completing the development cycle.

Through the years valve caps have endured as the final and sure secondary seal. Primary seal for inflation or deflation were by means of "dolly" pins or check valves, and the final closure was provided by the valve cap.

Valve caps, as a final closure—and to keep dirt and dust from the valve seal—are essential, as are the threads to which they are applied. These are needed for pump connections, extensions, and service and fishing tools.

With tires running more than a total of 100,000,000 miles over the earth every hour, tire valve standardization is essential. Expense and delay would result had not all tire engineers standardized on valve stems with replaceable cores and caps that assure international standardized manufacture, distribution, and availability. The Tire & Rim Association has been influential in this standardization.

It is an interesting fact that the replaceable core and cap, with the tire valve housing is the only standard in world-wide use in the automotive industry—if not in any industry. There have been sporadic attempts to change these standards under the guise of novelty or reduced cost —but the merits of the existing design are too established for any serious departure.

Distributers' Tire Stocks

(*Continued from page 42*)

the oil-company distributers' group; some reports covered stocks in central warehouses only; while others also covered stocks in about 16,000 retail outlets. A slight reduction in total stocks of casings, but a slight increase in stocks of inner tubes occurred during the final quarter of 1940, as revealed by the index numbers below.

Oil-Company Reported Stocks

	October 1, 1940	January 1, 1941
Number of firms	34	34
Casings	951,202	941,911
Tubes	825,619	819,319
Index Numbers:		
Casings	108.5	107.4
Tubes	91.0	93.4

Other Mass Distributers' Stocks

Reports were received from six tire manufacturers operating 2,087 retail stores and covering 931,536 casings and 691,828 tubes held in those outlets and from nine other mass distributers operating 2,088 retail stores (and/or doing mail order business) and covering their total stocks. Both groups were holding lower stocks of casings and tubes on January 1 than on October 1, 1940. The reported stocks for these groups, shown in the following table, are regarded as complete, for purposes of this survey.

Mass Distributers' Reported Stocks

	October 1, 1940	January 1, 1941
Number of firms	15	15
Number of stores	4,119	4,175
Casings	2,339,522	2,250,437
Tubes	1,754,244	1,555,354

Stocks of tire manufacturers included above are also included in manufacturers' stocks as reported by The Rubber Manufacturers' Association, Inc.

Acknowledgment

The support of The Rubber Manufacturers' Association, Inc., the assistance of the National Association of Independent Tire Dealers, and the cooperation and promptness of dealers, oil-company distributers, manufacturers, and other mass distributers in submitting data used in this report are gratefully acknowledged. We especially thank all dealers who have submitted data and urge them to report regularly in future, as regularity is essential to trustworthy estimates of total dealers' stocks. The survey is open to participation by any tire dealer.

Properties of Some Synthetic Rubbers[1]—II

L. B. Sebrell[2] and R. P. Dinsmore[2]

THE following installment concludes the interesting and informative article on properties of certain synthetics begun in our March issue.

Compounding Properties of Certain Selected Synthetic Rubbers

In this study attention will be limited to the neoprene types, the Buna types, "Thiokol", Chemigum, and Hycar. Since Chemigum is a product of The Goodyear Tire & Rubber Co. and is made in three different grades of hardness, the compounding results on the three grades are given. All of these rubbers are compared as to their several properties with natural rubber.

From a processing standpoint, the relative workability is indicated in some measure by the extrusion plasticities of the synthetics themselves as shown in Figure 1. These values are cubic centimeters per minute at 200 pounds per square inch pressure at 92° C. This chart shows that of the entire list, only Chemigum I and Neoprene I are really soft and workable of themselves. The remainder of the list is very tough and shows little tendency to knit together or to flow smoothly when placed on a mill. In many cases, notably Chemigums II and III, Hycar OR and Buna N, not a great deal can be done in the way of further softening except by the addition of large quantities of liquid softeners. Severe milling or the use of peptizing agents does not effect any appreciable improvement in the handling of these rubbers. Neoprene GN and Buna S, on the other hand, can be softened by the use of peptizing agents to practically any desired stage. "Thiokol" can be softened by the addition of small amounts of certain rubber accelerators. By far, the most serious aspect of the successful use of these rubbers is their difficult processability.

With this understanding of the condition of these rubbers themselves, we can proceed to a discussion of their properties in practical compounds. For this purpose we have selected two compounds, one of which represents a tread type, and the other a mechanical goods type of formulation. The essential difference between the two is one of loading, the tread type being loaded with 50 volumes gas black, and the mechanical goods type being loaded with 50 volumes of a semi-reenforcing soft black commonly used in this type of formulation. No attempt was made to bring out the best properties which may be obtained with any of the individual rubbers.

The tread type will be discussed first, and on Figure 2 are shown the tensile strengths of the series. All of the synthetics, with the exception of "Thiokol", show excellent to fair tensile values in comparison to natural rubber, indicating good quality in this respect. Elongations at break

[1] Abstracted from a paper presented at the annual meeting of the Society of Automotive Engineers at the Book-Cadillac Hotel, Detroit, Mich., Jan. 6 to 10, 1941.

[2] Goodyear Tire & Rubber Co., Akron, O.

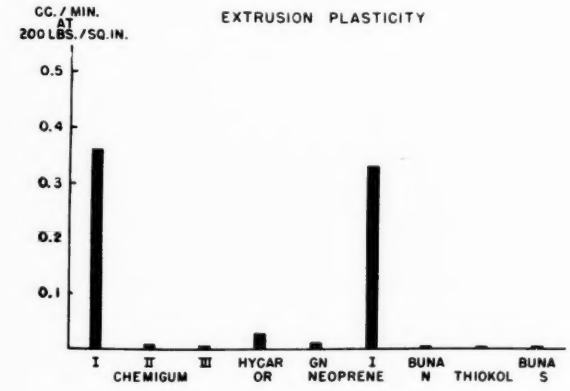


Fig. 1

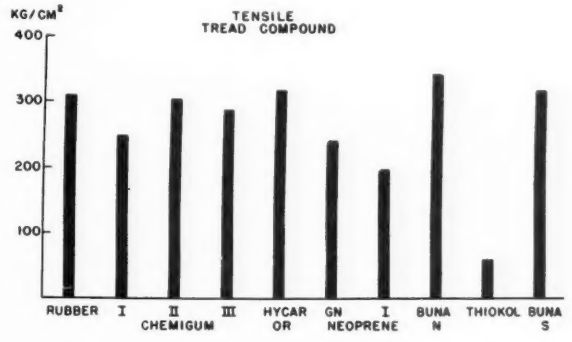


Fig. 2

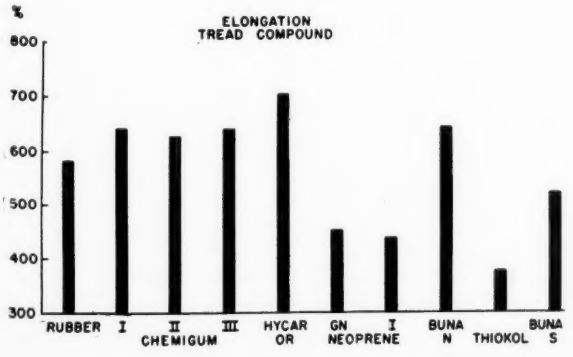


Fig. 3

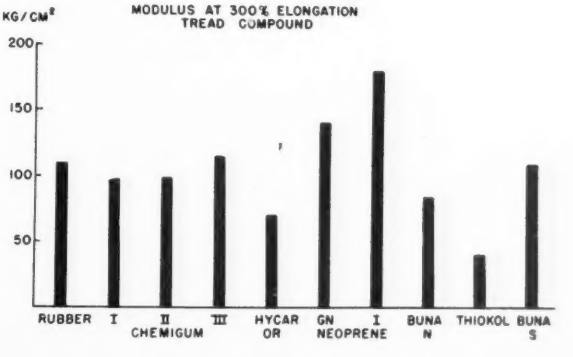


Fig. 4

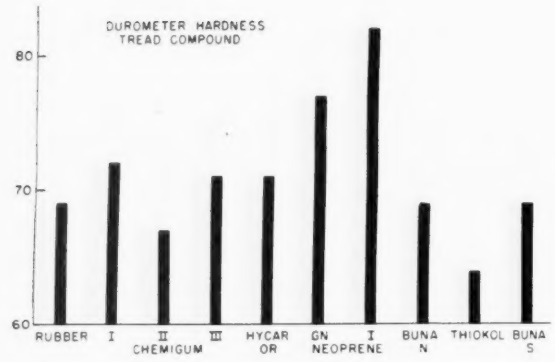


Fig. 5

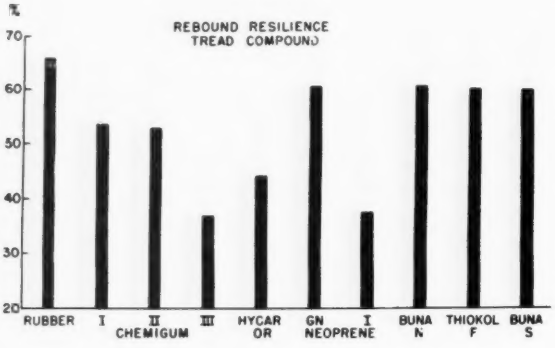


Fig. 6

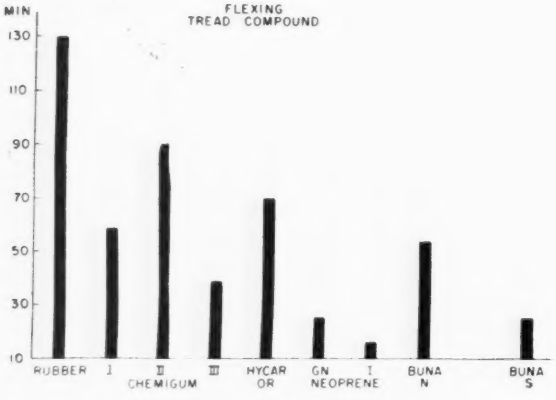


Fig. 7

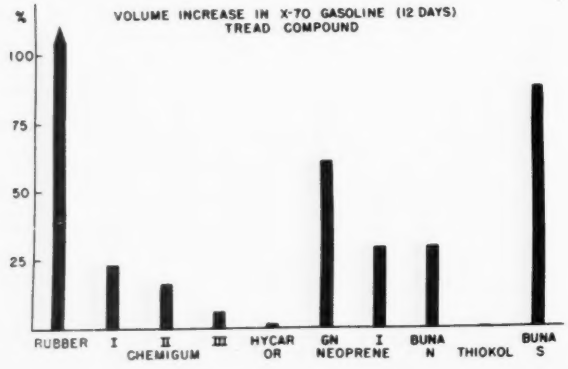


Fig. 8

corresponding to these tensile values are shown in Figure 3, and here again it may be concluded that practically all of the series, with the exception of "Thiokol", show sufficient elongation to cause no great concern. Neoprene GN can probably be softened to give greater elongation than was obtained in this case.

Figure 4 shows the modulus at 300% elongation. This value generally reflects the stiffness of resistance to deflection, and where large variations are involved, is reflected in the durometer hardness shown in Figure 5. Aside from the neoprenes, these values also compare favorably with natural rubber. The Neoprene GN could probably be further softened to bring it more in line with the rest.

Figure 6 shows rebound values, and here becomes apparent one of the deficiencies of synthetic rubber. Rebound is expressed as the per cent. energy returned to a standard pendulum falling from a given height. Rebound is a measure of energy absorption and is a fair index of the tendency for heat generation and buildup where the compound is subjected to deflection cycles at a rapid rate. No one of the synthetics is the equal of natural rubber in this respect, and small differences quickly become apparent where service is severe. It is not without considerable development effort that the synthetics have been made as good as here shown, and for many uses this is satisfactory and adequate.

Resistance to flexing is shown in Figure 7. The values are minutes to failure for a special type of test piece stretched to 60% elongation and returned to 0% elongation and given a pseudo compression of 45%. The compression is not actually that since the piece is free to bend upward through this portion of the cycle. Here again the synthetic rubbers are not the equal of natural rubber, but definite progress has been made in adapting them to uses where this property is a particular requisite. These flexing tests were made on the standard Goodyear flexing machine. The effect of permanent set on the synthetic rubber test pieces has not, as yet, been definitely determined, and it may be that if the set is appreciable, it will affect the values given.

Figure 8 shows the per cent. volume increase when the series of compounds is immersed in a standard motor gasoline for 12 days. Rubber, as would be expected, is very bad. Chemigums, I, II, and III are progressively better, Chemigum III being very good, as is also the Hycar.

Grasselli abrasion loss, shown in Figure 9, while not a reliable index of service abrasion, indicates such a degree of superiority for the synthetics, other than "Thiokol", over natural rubber that there is a reasonable justification to expect a fairly good performance from the synthetics in general. This has been proved in a number

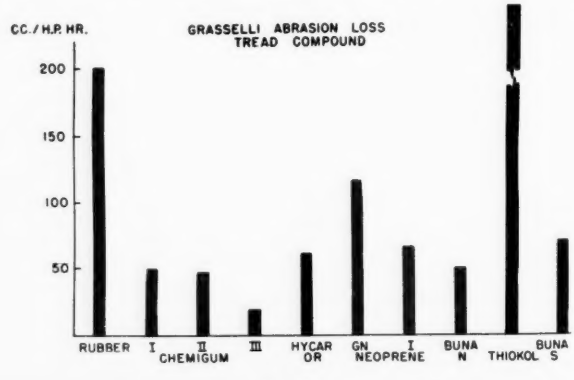


Fig. 9

of cases where the synthetics actually showed a slight superiority to natural rubber in road-wear abrasion measurements of tire treads.

The tensiles and elongations of the mechanical goods type of formulation are shown in Figures 10 and 11 respectively. Here again many of the synthetics show equal or better quality than natural rubber. Shore hardness, shown on Figure 12, indicates these compounds to be harder than might generally be used for this purpose, but they can readily be softened within reasonable limits by the addition of the proper softeners. The ability of a synthetic to take a given load with a minimum increase in hardness is an important characteristic. It was for this reason that this compound was not complicated by the use of softeners.

The swelling of this type of compound in a standard gasoline is shown in Figure 13. Rubber is very poor. Buna S, which is not recommended for this purpose, is next in order. Neoprene I is considerably better than GN and compares with Chemigum I. Chemigum II and Buna N are comparable and Chemigum III, Hycar OR, and "Thiokol" are the best of the series.

The swelling values for benzol are shown in Figure 14. Chemigum III and Hycar are the best of this series.

Summarizing our observations in a tire tread type of formulation, it may be concluded that with the exception of "Thiokol", they all may be used for tire treads where the service requirements are not too severe. For severe service, Chemigums I and II and Neoprene GN are to be recommended, but they cannot at present be expected to equal natural rubber in the severest types of service. For other applications, where a relatively high-quality stock such as a high-quality mechanical goods stock is desired, these synthetics have distinct possibilities and offer the added feature of superior resistance to swelling when exposed to gasoline and other solvents.

The problems involved in the compounding of these various types of synthetic rubbers have already been discussed.

Dynamic Tests on Synthetic Rubber Stocks

In the description of a new dynamic test and the data which we have obtained on various synthetic rubbers in this test, it is our purpose to supply sufficient information on the physical characteristics of the various synthetic rubbers as would allow an engineer properly to design certain types of vibration and automotive equipment in which he might be interested.

In the case of synthetic rubber it is especially important

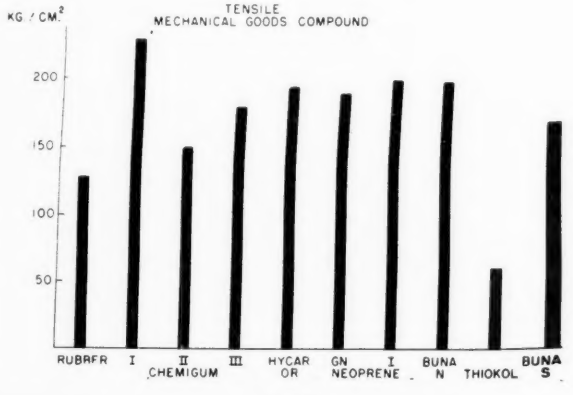


Fig. 10

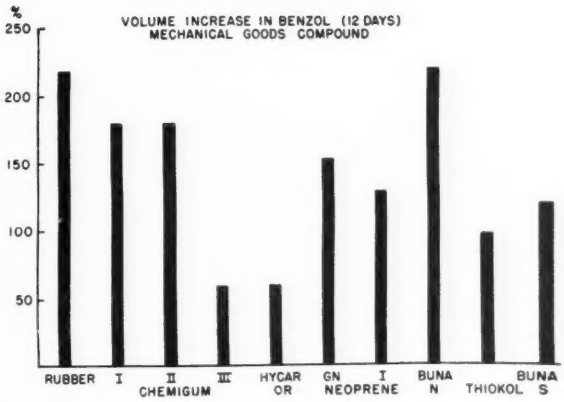


Fig. 14

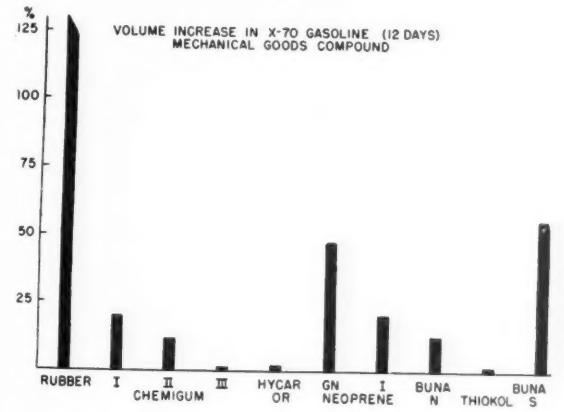


Fig. 13

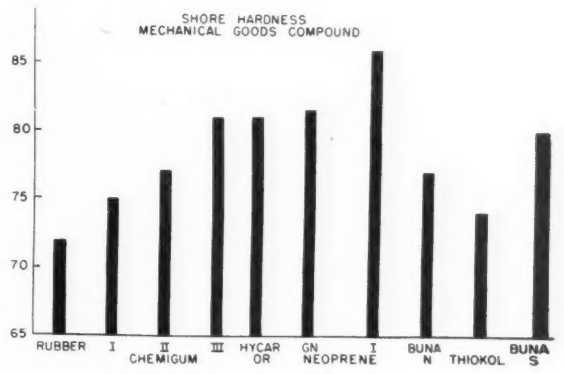


Fig. 12

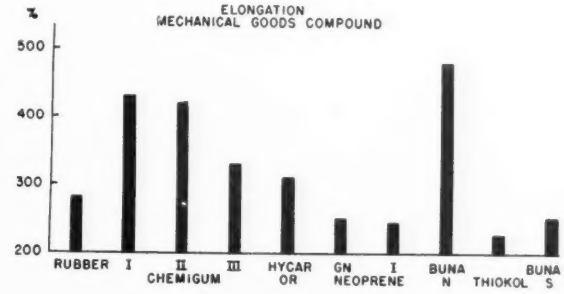


Fig. 11

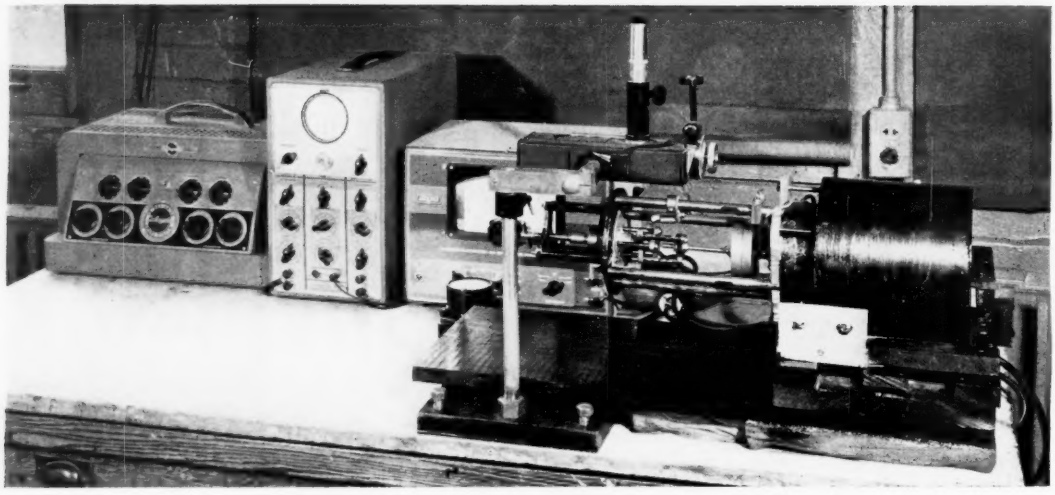


Fig. 15. Goodyear Apparatus for Measuring Dynamic Properties

to have tests which can evaluate the elastic properties of the stocks in a range of low deformations corresponding to those encountered in most applications rather than to rely on the indications for ultimate values of tensile strength and elongation entirely.

This point is illustrated by some data published by E. Rohde.[3] Hysteresis loops, secured in the normal manner with a tensile testing machine, indicated that after ten cycles the energy loss for a natural rubber tread stock was about six times as great as for a Buna S tread. In actual tests on tires the Buna S tread, however, did not run at a lower temperature when compared with the natural rubber tread.

Hysteresis loops were then obtained for various ranges of elongation. It was found that, for the tread stocks tested, natural rubber was superior in elasticity and work capacity for tensile stresses below 35 kilograms per square centimeter. Only above this stress was Buna S superior. Consequently this advantage did not show up when the stocks were employed as tire treads.

In the same vein many of the apparently contradictory test results for synthetic rubbers will probably, at some future time, find a logical explanation. Wherever there is such an interaction of plastic and elastic properties as occurs for the synthetic rubbers, it becomes necessary in testing to define closely many variables which otherwise might not be so important. These include the time rate of the deformation, the character of the deformation, the range of stresses and elongations, and the temperature.

Several dynamic tests have been described and applied to synthetic rubber stocks.[4] In the Goodyear research laboratories a modification of the method of Naunton and Waring has been developed by Drs. R. B. Stambaugh and S. D. Gehman and used extensively for measurements of dynamic properties of synthetic rubber stocks. Figure 15 is a photograph of the apparatus. As in the apparatus of Naunton and Waring, two opposed rubber test pieces are set into forced vibration by means of an alternating current which passes through a coil in a strong magnetic field. The resonance frequency for the system, at which relatively large amplitudes of vibration occur, depends upon the stiffness of the rubber and the mass of the vibration system.

[3] *Kautschuk*, 15, 64 (1939), *Rubber Chem. Tech.*, 4, 799 (1939).
[4] F. L. Yerzley, *Proc. Am. Soc. Testing Materials*, 39, 1180 (1939), *Trans. Am. Soc. Mech. Engrs.*, 62, 469 (1940); H. Roelig, "Proceedings of the Rubber Technology Conference—1938", London, p. 821; W. J. S. Naunton and J. R. S. Waring, *Ibid*, p. 805, and *Trans. Inst. Rubber Ind.*, 14, 340 (1939).

The procedures used in the test differ considerably from those described by Naunton and Waring. The vibrator is mounted horizontally in order to obtain the same compression in the two test pieces used. The test pieces are vibrated under a fixed static compression of 8%. The measurements are made at a constant frequency of 60 cycles a second, which is in contrast to the higher and variable frequencies used by Naunton and Waring. The use of a constant frequency is made possible by tuning the system to resonance by variation of the vibrating mass. Enough power is supplied to the system to secure amplitudes which can be read directly by means of a traveling microscope. Naunton and Waring employed a vibration pick-up and amplifier for this purpose.

The alternating driving force for the vibration is determined by the alternating current through the coil. The coil is calibrated by ascertaining the force necessary to hold it in the equilibrium position for various direct currents. A straight line current-force calibration is obtained.

The equation of motion for the system is:

$$m\frac{d^2x}{dt^2} + b\frac{dx}{dt} \times sx = F\cos pt \qquad (1)$$

m = vibration mass.
b = proportionality factor between velocity and frictional force.
s = spring constant of system.
F = maximum value of driving force.
p = angular frequency = $2\pi \times$ cycles per second.
t = time.
x = displacement.

In the calculations all these quantities are expressed in c.g.s. units.

The solution of the above equation gives

$$x = \frac{F\cos(pt - \theta)}{\sqrt{(s - mp^2)^2 + b^2p^2}}\ ;\ \tan\theta = \frac{bp}{s - mp^2} \qquad (2)$$

At resonance it can be assumed that

$$s = mp^2 \qquad (3)$$

Hence the dynamic stiffness is determined by the vibrating mass, p being constant and equal to 120π.

TABLE 1. RESULTS OF DYNAMIC TESTS

Test pieces: ½" high x ½" diameter.
Frequency: 60 cycles per sec.
Static load: 8% compression.
Driving force: 1.7 x 10^8 cynes (Current: 2.5 amps.)

Comp. No.	Type of Rubber	Type of Compound	Amplitude at Resonance (Mm.)	Dynamic Modulus Kg./Sq.Cm.	Internal Friction c.g.s. Units x 10^{-8}	Resilience %	Hf (f = 1.73 Kg.)	Hx (x = .15 Mm.)
T-18	Natural rubber	Tread	.900	76	25	45	100	100
R-337 P-735	Chemigum I	Tread	.315	148	72	31	64	140
R-340 P-12	Chemigum II	Tread	.170	286	132	33	33	240
R-340 P-13	Chemigum III	Tread	.042	378	544	3	35	440
R-339 P-19	Neoprene I	Tread	.068	350	344	10	36	380
R-339 P-18	Neoprene GN	Tread	.325	203	69	42	40	159
R-340 P-10	"Thiokol"	Tread	.337	106	40	40	78	60
R-340 P-21	Buna N	Tread	.364	159	62	39	53	135
R-340 P-23	Buna S	Tread	.448	148	51	44	53	123
R-337 P-736	Hycar	Tread	.260	143	87	23	73	144
R-340 P-15	Natural rubber	Mechanical goods	.338	151	67	34	60	126
R-339 P-23	Chemigum I	Mechanical goods	.148	303	152	30	32	262
R-340 P-17	Chemigum II	Mechanical goods	.128	318	177	26	32	291
R-340 P-18	Chemigum III	Mechanical goods	.023	671	1000	1	29	810
R-339 P-22	Neoprene I	Mechanical goods	.046	642	368	25	16	580
R-339 P-21	Neoprene GN	Mechanical goods	.150	315	150	32	30	264
R-340 P-20	"Thiokol"	Mechanical goods	.171	251	132	28	40	223
R-340 P-19	Buna N	Mechanical goods	.158	295	143	31	33	252
R-340 P-22	Buna S	Mechanical goods	.125	356	181	29	27	310
R-340 P-14	Hycar	Mechanical goods	.038	399	602	3	34	462
R-200 D-105	Chemigum II	20 parts gas	.690	86	33	40	96	96
R-200 D-106	Chemigum II	30 parts black	.353	132	64	31	72	105
R-200 D-107	Chemigum II	40 parts black	.165	207	137	20	53	203

$$X_{res.} = \frac{F}{bp} \tag{4}$$

The amplitude at resonance, $X_{res.}$ is measured, and F, the driving force, is known from the driving current. Hence b can be calculated.

From the value of S, the dynamic modulus can be calculated from the formula,

$$E = \frac{sh}{2A} \tag{5}$$

E = dynamic modulus.
A = area of end of test piece.
h = height of test piece.

The coefficient of normal viscosity discussed in vibration theory[5] is used as a measure of the internal friction. This is given by the equation

$$\eta = b\frac{h}{2A} \tag{6}$$

η = coefficient of normal viscosity.
(The other letters have been previously defined.)

Naunton and Waring used for the resilience the ratio calculated for the amplitudes of two successive free vibrations of the system. The vibrational energy, however, is proportional to the square of the amplitude,[5] and we have taken this measure of the resilience.

From vibration theory (see reference in the preceding paragraph), this ratio is given by

$$R = 100\, e^{-2\pi b/mp} = 100\, e^{-2\pi t\eta/E} \tag{7}$$

R = dynamic resilience.

The calculations from the experimental results are very simple. For a sample size of one-half inch high by one-half inch diameter, constant frequency of 60 cycles per second, constants can be calculated for equations (3), (4), (5), (6) and (7) to give

$$E = .0725\, m \tag{8}$$

m is the mass of the vibrating system in grams for resonance at 60 cycles.

E is the dynamic modulus in $\frac{\text{kg.}}{\text{cm.}^2}$

$$\eta = \frac{902}{X_{res.}}\, i \tag{9}$$

η is in c.g.s. units; i is the root-mean-square current in amperes, and $X_{res.}$ the amplitude at resonance in cm. The constant depends upon the force calibration of the coil.

$$R = 100\, e^{-2.42 \times 10^{-3}\, \eta/E} \tag{10}$$

Formulas for calculating the relative heat generation when comparing stocks for the same cyclic force H_f and for the same cyclic deflection H_x have been worked out by Naunton and Waring.[6] They are

$$H_f \propto \frac{(100-R)F^2}{E} \tag{11}$$

for the same force F, and

$$H_x \propto (100-R)\, EX^2 \tag{12}$$

for the same deflection X.

Table 1 gives some data secured from the test for a variety of synthetic rubber compounds.

It is found that values of dynamic resilience from the test correlate rather closely with the per cent. rebound as determined by the rebound pendulum. Figure 16 shows a plot of per cent. rebound against per cent. dynamic resilience for a wide variety of synthetic rubber stocks. It will be noted that for these stocks, the resilience varies over a range from 3 to 48%, whereas the rebound has a narrower range, 28 to 65%. In general the dynamic resilience, as determined from the test, gives lower values and a larger spread between results for similar stocks than does the pendulum rebound test.

The calculated relative heat generation rates for the same cyclic force, given in the next-to-the last column of Table 1, show an advantage for the synthetic rubber stocks as compared to natural rubber, due principally to the higher values of the dynamic modulus for the syn-

[5] A. L. Kimball, *Proc. Am. Soc. Mech. Engrs.*, 51, 227 (1929).
[6] *Trans. Inst. Rubber Ind.*, 14, 340 (1939).

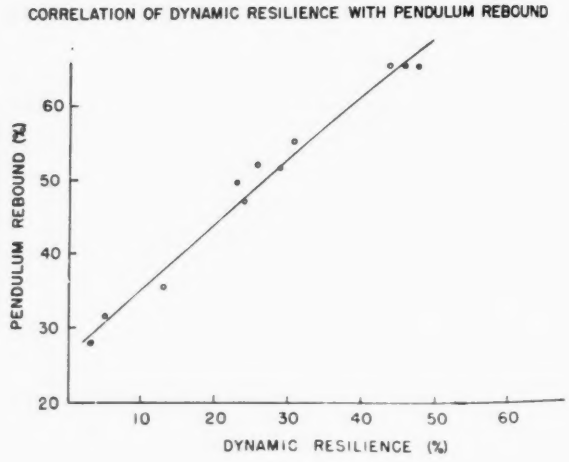


Fig. 16

thetic rubber stocks. For the same force, this results in much smaller deflections and hence low heat generation.

The calculated relative heat generation rates for the same amplitude of vibration are given in the last column of Table 1. The calculation of H_x is complicated by the fact that the dynamic modulus and resilience depend somewhat on the amplitude, as was noted by Naunton and Waring.[7] Hence values of E and R from Table 1 cannot be used directly in equation 12, but must be corrected to the same value of the amplitude. The value of the amplitude used for the comparison of the stocks was 0.15 mm. The natural rubber tread was taken as the standard. At this amplitude E had a value of 129 kg./sq. cm., and R a value of 37%. Corrections were made, when necessary, to the values of E and R for the other stocks to allow for differences in amplitude at which E and R had been determined.

The data for the last three compounds in Table 1 show the controlling influence of the gas black loading on the dynamic properties. In this case only about half of the loading of gas black was required to give the synthetic rubber stock the same dynamic modulus as the natural rubber tread stock. For this loading the resilience is nearly as high as for the natural rubber tread stock. For the same loading of gas black, however, the synthetic rubber gave a much stiffer and less resilient tread stock than natural rubber.

The above data on the relative effect of increased carbon black loading show that with a low loading the properties of natural rubber may be closely approximated, and for uses where high resilience and low internal friction, with resulting low heat buildup, are required, it undoubtedly would be most feasible to reduce the carbon black loading as indicated. It would, of course, be more expensive to use this type of compounding in a mechanical goods part than the type which has always been used with rubber. However this fact illustrates very forcefully the fact that synthetic rubber cannot be substituted for natural rubber on a quantitative basis or on an equal cost basis without examining carefully the physical properties which are to result from such a procedure.

Acknowledgment

The authors wish to acknowledge the aid and cooperation of M. J. DeFrance, S. D. Gehman, and J. E. Field, of the research laboratory of the Goodyear Tire & Rubber Co., in the preparation of this paper.

[7] "Proceedings of the Rubber Technology Conference—1938", London, p. 805.

Positively Charged Latex

(*Continued from page* 39)

charged latex solutions of still higher rubber content can be prepared.

The effect of the addition of such compounds as dioctyl sodium sulpho-succinate, isopropyl naphthalene sodium sulphonate, and the tauric acid ester of the sodium salt of isethionic acid on latex before and after the addition of cationic soap was investigated. The materials tend to stabilize negatively charged latex, and the first two compounds listed above prevented cetyl pyridinium bromide from reversing the charge, when the amount of cationic soap was 5% on the dry rubber content. It was found that a stable positively charged latex could be prepared, in the presence of the third compound listed above, with cetyl pyridinium bromide and acetic acid. The dry rubber content of such a preparation had a maximum value of about 20%.

The authors wish to express their thanks to E. I. du Pont de Nemours & Co., Inc., for supplying cetyl pyridinium bromide and cetyl trimethylammonium bromide for use in this investigation.

Brazilian Rubber Industry

(*Continued from page* 38)

rubber goods for electrical purposes as well as appliances for motor cars, radios, etc. Pirelli S.A. (Figure 11) produced during 1939 electrical conduits insulated by rubber, in an amount of about 2,000 metric tons. The rubber tire plant was recently rebuilt to give an output of 250 tires daily.

More recently two new American concerns started manufacturing tires and inner tubes in São Paulo. The Goodyear plant (Figure 12) started to produce in the beginning of 1939 tires and inner tubes for motor cars, trucks, and buses in the amount of 500 units daily, besides rubber heels for shoes. The Firestone factory will commence to operate during the early months of this year. These two plants will also manufacture tires and inner tubes for other well-known world tire manufacturers who have distribution, but no factories in Brazil.

All these plants are using Brazilian rubber; consequently the crude rubber production will be greatly developed in the next year. Steps have already been taken by President Vargas, through the Ministry of Agriculture, for the immediate resettlement of workers in the rubber growing districts of Amazonas, Pará, and Acre. As a result of the recent visit of President Vargas to this zone, natives will be properly instructed in improved methods for the coagulation of latex. Scientific planting will also be developed with the establishment of federal financial aid and supervision. This will permit in the very near future an increased exportation of rubber to countries now being supplied by the East Indies.

In accordance with the wishes of President Vargas, the rubber goods producers offered to the Brazilian Government means for the installation of a research laboratory. A new division on rubber was created in the Instituto Nacional de Technologia, at Rio de Janeiro, and the necessary equipment is being installed. Donations were made not only by Brazilian firms, but also by American concerns, such as Goodyear and Firestone.

When all the factories are in operation and extensions finished, Brazilian requirements of about 400,000 tires will be fulfilled, and export markets for both crude and manufactured rubber may then be canvassed.

How Rubber Tires Have Changed Farm Equipment and Methods[1]

Eulon Pritchett[2]

Eulon Pritchett

RUBBER tires have proved their practicability for use on farm implements. They are now being used on almost every type of farm equipment. With rubber tires have come several changes in design and construction of farm implements. These new implements are being put to many new uses. This trend toward redesigning was brought about by the use of rubber tires.

With the advent of rubber tires for use on farm equipment, virtually all types of farm implements have been designed to operate at higher speeds. With high-speed equipment a farmer may cultivate more acres of land. If this is impractical or impossible because of his inability to get additional land, he may cultivate the same number of acres more intensively. He may also cultivate land farther away from his home. He can take his tractor and implements a few miles on the highway very quickly. Thus more land will fall into the hands of farmers who possess the means and are capable of farming it successfully.

With the high-speed, rubber-tired implements, the farmer may speed up the work of plowing, planting, cultivating, and harvesting. He may harvest his crops much more quickly, thereby lessening the danger of damage by weather. As less time is required for a certain job, the labor and fuel cost is reduced. The farmer may do more custom work farther away from home, if he chooses.

The successful farmer has always led a hard-working life. Now, if he is satisfied with his present number of acres, he may have more leisure time to enjoy. This places him more on a level with workers in other occupations. He may enjoy more pleasures and recreation. This will keep some farm youths from wandering to the cities in search of easier jobs and shorter hours. Thus rubber tires may contribute toward a better life for farmers.

When implements are designed primarily for rubber tires, they may be built lighter than old-type implements. As they are not subjected to such jolting, they will be relatively stronger and sturdier. With light, strong alloys, better bearings and lubricating systems, they are ready to operate at much higher speeds. The lighter implements, of course, give less resistance to rolling. With rubber tires this lighter equipment may be taken into fields much too wet and soft for old-type equipment.

Rubber tires on tractors increase traction, making it possible to pull plows with more bottoms, drills and cultivators that plant and cultivate more rows. They also enable a tractor to pull greater capacity harvesting machines. Thus the greater traction of rubber tires increases the speed of plowing, planting, cultivating, and harvesting.

Great flexibility and a larger number of uses have come with the lighter, faster machines on rubber tires. Many farmers use their rubber-tired tractors for hauling on the highway, carrying heavy loads on trailers, usually for short distances. Farm wagons and trailers on rubber tires have been a great factor in increasing the amount of hauling carried on with tractors. With old-type, steel-wheel tractors, the steel lugs had to be removed for hard-surface road hauling. Even then the speed attained by rubber-tired equipment would give the tractor and rider a rather bad jolting. A change toward more comfortable seats and better vision for the operator has taken place. As rubber tires take much of the shock out of bumps, it is easier to make rubber-tired riding implements more comfortable. In the future a farmer may do much of his highway hauling with his rubber-tired tractor and implements, replacing to some extent the farm motor truck.

Because protection from shocks and jarring is afforded, repair bills are substantially lower. The tractor on rubber tires burns much less fuel, because it, like other implements, is easier to move on rubber tires. Of course changes must be made in wheel types because they must have rims for rubber tires. Wheel sizes must be, and eventually will be, standardized to permit interchanging of tires on different implements. Also wheels will be made to fit several different implements so that the farmer who cannot afford rubber tires for all his implements may use the same wheels and tires on several implements with a minimum loss of time for the changeover. Thus a farmer may get the benefit of rubber tires on all his implements without such a high first cost. This plan brings the extra advantages of rubber tires down in reach of the small farmer.

In a comparatively short time rubber tires have come into widespread use on farm equipment. At first rubber tires were put on implements designed more or less primarily for steel wheels. Even then they were so satisfactory that they in a few years have caused changes in almost every type of farm equipment. Rubber tires are even more satisfactory on implements designed and constructed especially for them. In this way the changes in design and use of farm equipment will help to bring about more universal adoption of rubber tires for agricultural purposes.

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[1] Winning essay in the 1940 National Farm Essay Contest conducted for high school boys living on farms in America by the Goodyear Tire & Rubber Co., Akron, O. Judges of the competing essays were Prof. G. W. McCuen, Agricultural Engineering Dept., Ohio State University; Prof. Wm. H. Hildreth, Dept. of English, Ohio State University; and G. G. McIlroy, president American Soybean Assoc., Irwin, O. This essay is published with the permission of the Goodyear Tire & Rubber Co. and the author.

[2] Sixteen years of age and attending Dixon Mills High School, Dixon Mills, Ala.

EDITORIALS

Oil Fields Increasing

IN THE light of the rapidly increasing importance which oil, as a basic material, is assuming in our national life, the question of continuity of our oil supply is frequently raised.

According to information compiled by the American Petroleum Institute, the discovered sources of supply are becoming more numerous, which fact indicates that no shortage need be expected. Preliminary reports indicate that in 1940 there were 306 new fields and 193 new formations added to the oil area in the United States. The total of 306 new fields discovered in 1940 is almost twice the 165 fields discovered in 1936 and compares with 259 in 1939, 264 in 1938, and 224 in 1937. Thus during the past five years a total of 1,218 new fields have been located. The 193 new oil-producing formations discovered in 1940, although slightly below the 215 found in 1929, constitute a higher rate of discovery than in any other previous year. Many of these new "sands" were found at different depths in older oil fields as the result of further search and deeper drilling.

Through the resourcefulness of the chemist many new synthetic materials find their origin in the oil fields. Such products, of ever-increasing importance in assuring the continuity of high-quality rubber products, are carbon black and butadiene, the latter of which is of consequence as a base for some of the synthetic rubbers now regarded as strategic materials.

Because of the great prominence of gasoline and rubber in conducting defense operations as well as in our normal activities and because of the utility of other products similarly derived, oil is rapidly approaching iron as an essential natural resource and appears to be equally as inexhaustible.

Labor Has a Responsibility

THE recent rapid increase in demands by labor directed primarily at companies working on government orders cannot in any sense be interpreted as a willingness on the part of labor unions to accede to the often repeated desire of the government that no advantage be taken of the present situation. Profiteering by industrial companies would be a very unpopular course to follow. Unusual demands by labor at this time when full production is so urgent constitute a form of profiteering just as surely as would an increase in the selling price of a product based on scarcity. By maintaining the status quo as regards cost and continuity of production the desire to prevent inflation and unbalance can best be fulfilled. The patriotic duty to eliminate increased personal gain, but promote stability and accelerate production rests just as fully upon labor as upon industrial management. The benefits of greater production to both labor and management will depend upon the degree of cooperation and reason that is contributed toward the objective, the seriousness of which is of equal importance.

Profitless National Income

THE extent to which national income from government sources has increased in recent years is evident from the fact that in 1913 it constituted 5.5% of the total realized national income, in 1930 it was 9.8%, and, according to preliminary estimate by the National Industrial Conference Board, in 1940 the total income received by individuals from governmental sources reached a new high record of 18.4% of the total national income. Estimated on the basis of salaries and wages to government employes, interest on government bonds, pensions, compensation for injuries, relief and other payments to individuals by federal, state, and local governments, the 1940 disbursements amounted to 13.2 billion dollars, as compared with 12.7 billions in 1939 and 1.8 billions in 1913.

This rapid increase in government expenditures during recent years means that we have reached the status where almost one dollar out of every five of the total national income is money paid by the people to the people and constitutes simply a transfer of money with no opportunity to earn a profit from which to help pay the costs of government. Accordingly when considering the national income that is effective in providing a means of governmental support, this non-profit income should be deducted from the total national income, thereby establishing the effective income for 1940 at a figure 13.2 billions below the usually considered amount.

While industrial income is responding to the stimulus of the defense program, a great portion of the increased profits resulting from a larger volume of business is already being absorbed by higher taxes. For a group of 120 industrial companies the Conference Board has found that federal income and excess profits taxes alone have risen 141% for 1940.

In view of the tremendous current and future expenditures for defense purposes which can be compensated only through taxes there is increasing need of reducing governmental non-defense expenditures. As administration of defense activities will require increased personnel, the conservation of man-power in non-essential governmental administration is rapidly becoming a question of prime importance.

S. A. Stillwagon

EDITOR

What the Rubber Chemists Are Doing

Large Attendance Expected at Rubber Division Meeting

WITH advance reservations indicating an attendance of at least 250 at the meeting on April 10 and 11, of the Division of Rubber Chemistry, A. C. S., which is to be held in conjunction with the Society meeting April 7 to 11, it was found necessary to shift the technical sessions and banquet from the Hotel Mayfair to the Hotel Statler, only one block away. Headquarters for the division will be at the Mayfair, where members may register on Wednesday afternoon, April 9, and Thursday morning, April 10.

The Rubber Division banquet will be held Thursday evening, April 10, in the ballroom of the Hotel Statler, with dress informal. After the dinner a floor show, lasting 80 or 90 minutes, will be followed by dancing.

F. W. Frerichs, of the Cupples Co., is chairman of the local committee in charge of arrangements, of which other members are: L. K. Ayers, The George S. Mepham Corp.; F. W. Knoke, American Zinc Sales Corp.; G. K. Trimble and R. C. Randall, Midwest Rubber Reclaiming Co.; and A. H. Smith, Monsanto Chemical Co.

The meeting will open on Thursday afternoon at 1.30 p.m., with the symposium of four papers on "New Developments in the Processing of Rubber", abstracts of which were published on page 51 of our March issue. We have learned from R. H. Gerke, Division chairman, that Andrew Hale, of Farrel-Birmingham Co., Inc., one of the symposium speakers, will present motion pictures of the Ford and Goodyear plants as well as slides to illustrate his talk on "Mechanical Developments in the Processing of Rubber." On Friday morning at nine o'clock, the Report of the Crude Rubber Committee will be presented by George A. Sackett, chairman, and the regular business meeting of the Division will be held from 11.30 a.m. to 12:00 noon. The technical sessions will be held from 9.30 to 11.25 a.m. and from 1.30 to 4.00 p.m. on Friday. Abstracts of the ten papers to be presented follow.

Abstracts

Relaxation Phenomena and Reversible Stress-Temperature Curves for Soft Rubber. An exhaustive study was made of the dependency of the stress upon time at constant extension for soft rubber with the objective of obtaining reversible stress-temperature curves. A large number of stress-time curves for elongations ranging from 3 to 400% were taken at three different temperatures. At room temperature the relaxation was studied for longer than a month. All stress-time curves were observed to exhibit the same type of behavior, and it was found that a good fit may be obtained by application of the equation:

$$F = F_u + F_1 e^{-t/\gamma} - F_2 t$$

After several days the long run relaxation curves exhibited in linear relation between stress and time. The slopes of these straight lines were quite small. The equation for the stress-time curves can be derived from the assumption that rubber behaves like a generalized Maxwell body.

After relaxation at the highest temperature employed, reversible stress-temperature curves were obtained by noting the change in force with decreasing and increasing temperatures, respectively. No thermal hysteresis was found, and straight-line stress-temperature curves were obtained for all extensions between 3 and 400%. At the two lowest extensions used (3 and 6%) the stress was a linearly decreasing function of the absolute temperature. At 11% extension the slope is positive. For higher extensions the slope of the straight lines increases with increasing extension. The negative slope at the lowest extensions is partly due to thermal expansion. The linear relation for the stress-temperature curves proves the existence of a large elasticity due to change in entropy during the stretching process as predicted by the statistical theory of rubber elasticity. The relation of the present work to earlier work, especially that of Meyer and Ferri, will be discussed. Robert L. Anthony, Ralph H. Caston, and Eugene Guth, University of Notre Dame, Notre Dame, Ind.

Dynamic Properties of Rubber and Their Dependence on Pigment Loadings. A method of measuring dynamic properties is described wherein the rubber is driven by a loudspeaker arrangement of coil and magnetic field at a frequency of 60 cycles per second. The system is tuned to resonance by varying the mass of the vibrating system. The mass at resonance determines the dynamic modulus; the amplitude at resonance, the internal friction. Dynamic resilience and relative rates of heat generation can be calculated.

The static modulus comparable to the dynamic value can be secured by passing a direct current through the coil.

Dynamic measurements are reported for a series of volume loadings of Superspectra black, channel black, Thermatomic black, zinc oxide, clay, and blanc fixe.

The dynamic properties are specific for the different pigments. Curves are given showing the dependence on the pigment loadings of the dynamic modulus, ratio of dynamic to static modulus, internal friction, dynamic resilience, and calculated relative heat generation at constant force and at constant amplitude. Some curves showing the effect of cure are also included.

For the same volume loading the dynamic modulus and internal friction increase in the order Superspectra, channel black, zinc oxide, clay, blanc fixe, Thermatomic, roughly in the order of particle size. The calculated dynamic resilience depends on the ratio of the modulus to the internal friction and improves in the order Superspectra, channel black, clay, Thermatomic, blanc fixe, zinc oxide. The dynamic modulus shows an almost linear relation with the internal friction for different loadings of the same pigment.

Some tests were made of the effect of frequency in the range 20-150 cycles per second. The dynamic modulus is independent of the frequency in this range. It depends upon the amplitude, an effect which may be connected with the warming of the test piece due to the vibration. The amplitude at resonance for the same driving force is approximately constant at all frequencies.

The results show the wide range of dynamic properties obtainable with different pigments and bring out the general principles involved in their use for dynamic purposes. S. D. Gehman, D. E. Woodford, and R. B. Stambaugh, Goodyear Tire & Rubber Co., Akron, O.

Hysteresis in the Crystallization of Stretched Vulcanized Rubber. II. X-Ray Studies of the Effects of Sulphur Content and Method of Curing. Utilizing the same methods with considerable improvement which were utilized in the paper presented before the Rubber Division at the Cincinnati meeting of the A. C. S. in April, 1940, results are now reported on a whole series of rubber samples in which the sulphur content of the original mixture varied from zero to 8%; and also for a series of specimens in which the time and temperature of curing varied widely for a given percentage of sulphur used in vulcanization. The method consists essentially in stretching the rubber samples over fixed intervals of elongation and making an X-ray diffraction pattern under extremely carefully controlled and calibrated conditions at each stage in the elongation up to a maximum of 600% where possible, followed by retraction over similar intervals again with an X-ray pattern at each stage. These data then make possible the establishment of the percentage elongation at which crystallization first appears, a value highly characteristic of any individual sample; the maximum degree of crystallization reached at the maximum elongation of the specimen as measured by the intensity of diffraction interferences; the course and shape of the hysteresis loop which develops upon retraction; and the percentage elongation at which the last evidences of crystallization disappear.

Some details of the new improvements in technique are: patterns made

in only five minutes, photometric measurement of intensities by a new Leeds & Northrup recording microphotometer, and intensity measurement of the halo corresponding to the uncrystallized portion of the rubber molecules at each stage of elongation. This latter measurement permits a more accurate evaluation of the relative proportions under each condition of stress of crystallized versus disordered areas of the specimen, leading to a more careful experimental evaluation of theories of structure. G. L. Clark and R. L. LeTourneau, University of Illinois, Urbana, Ill., and J. M. Ball, R. T. Vanderbilt Co., New York, N. Y.

Viscosity-Molecular Weight of Rubber. The Staudinger viscosity-molecular weight relation has been critically examined, and various procedures for fractionating and determining the molecular weight of rubber by the viscosity method have been studied. Recommendations are made to employ the equation $M = \frac{\log \eta_r \cdot K_{cm}}{C}$ based on the Arrhenius relation $\frac{\log \eta_r}{C} = K_c$ which holds true within narrow limits provided the viscosity range is not too great. To improve reliability the concentrations of solute have been employed to give relative viscosities of 1.7 ± 0.3.

Depolymerized rubber has been fractionated, and the viscosity-molecular weight constants K_m and K_{cm} have been determined on several fractions using both benzene and cyclohexane in the cryoscopic measurements of molecular weight. These results are discussed in relation to Staudinger's work.

The effect of various solvents on viscosity of rubber solutions has been considered, and the need of standardization on solvents and method of preparing the solution is emphasized. Chloroform has been selected as a good solvent for general use; however no solvent has been found which will completely dissolve first-quality plantation crepe or smoked sheet when protected against oxidation.

The chloroform-soluble portion of crepe constituting about 90% has been separated into several polyprene fractions whose average molecular weights range from 12,000 to 260,000. Gutta percha and balata hydrocarbons have been fractionated, and the average molecular weights of the separate fractions are practically the same as the original material. A. R. Kemp and H. Peters, Bell Telephone Laboratories, New York.

Oxidation of Unvulcanized Rubber in Light. II. In the previous paper it was shown that the tackiness developed during the exposure of unvulcanized rubber to light is due to oxidation. It was shown also that the presence of small amounts of various organic materials affected the rate of development of tackiness to a marked extent. Some materials greatly increased the rate; while others inhibited almost completely the development of tackiness. Among the materials conspicuous in accelerating the appearance of tackiness in unvulcanized rubber were the so-called antioxidants.

There was no proof that the tackiness is proportional to the extent of oxidation, and all results were qualitative, being based only on individual judgment. An apparatus has been developed for studying quantitatively this oxidation in the presence of light and at various temperatures. These quantitative experiments, in general, confirm the previously obtained results. Although the work is only of a preliminary nature, it has been found that the absorption of oxygen is approximately linear with time. So-called antioxidants may accelerate the oxidation under these conditions. The interval between the milling of the rubber and the determination of its oxidation rate has an appreciable effect on the latter, presumably due to the formation of peroxides. The opaqueness of the sample, due to added materials, retards the rate of oxidation. Some study has been made of the relative rates of oxidation in light and in the dark, both with and without catalytic materials. Oxidations have been carried out both in air and in oxygen. The rate of oxidation is retarded by materials not usually associated with the inhibiting of oxidation in rubber. J. T. Blake and P. L. Bruce, Simplex Wire & Cable Co., Cambridge, Mass.

A Study of Rates of Vulcanization. Presenting a New Method of Evaluating and Comparing Rates of Cure. The method presents a means of comparing rates of vulcanization directly, rather than by a study of the resulting effect of cure upon the chemical composition and physical properties of rubber compounds. Essentially the method is a determination of the minimum time to cure thick blocks of rubber without any porosity.

The success of the test depends upon removing variables and keeping the nature of the problem in mind. No absolute fixed set of test conditions is recommended, but a description of the test as conducted is given. In its exact form the test will not compare extent of porosity at any given "undercure", but will determine if one stock will require more of a minimum curing time than another. The point of minimum cure to prevent porosity is very precise and can be duplicated to within ten or fifteen seconds.

It is shown that the use of this test enabled evaluation of the curing rate of a series of crude rubbers in the same order as the tensile determination recommended by the Crude Rubber Committee of the Division of Rubber Chemistry of the American Chemical Society. Evidence that there was a fairly definite amount of free sulphur above which porosity resulted in this type of stock is in line with the holdings of the hydrogen sulphide theory of vulcanization.

By this test and by conventional tests it is shown that milling of rubber stocks retards the rate of cure. John G. Harrison, Jr., Vulcan Proofing Co., Brooklyn, N. Y., and Paul D. Bowers, Firestone Tire & Rubber Co., Memphis, Tenn.

The Surface Area of Commercial Carbon Black. The low-temperature nitrogen adsorption isotherm technique, as developed by Emmett and Brunauer, presents a convenient method of determining the total surface area of very finely divided pigments. The method has been applied to a number of commercial carbon blacks. The areas obtained are in good agreement with those calculated from recent estimations of particle size. The surfaces vary from 15 M^2/gram for thermal decomposition blacks, to 100 M^2/gram for reenforcing channel blacks, and 850 M^2/gram for intense color blacks. While there is a very general correlation of surface area and rubber reenforcement, cases have been found where blacks with nearly identical surfaces vary widely in reenforcing ability. Studies have been made of the adsorptive activity per unit area from heat of adsorption measurements.

The analytical properties of these carbons have been examined in the light of their respective surface areas. There appears to be a linear relation between these areas and iodine adsorption. Carbon blacks of a high volatile content possess a much larger surface than would be anticipated from their color value of "dark field count" diameters. The diphenyl guanidine adsorption shows no simple relation with adsorptive capacity or total surface of the black. W. R. Smith, F. S. Thornhill, and R. I. Bray, Godfrey L. Cabot, Inc., Boston, Mass.

Influence of Moisture Content of Carbon Black on the Properties of Rubber. The effect of variation in the moisture content of carbon black on properties of cured rubber such as modulus, tensile, and abrasion resistance and also on the extrusion time of an uncured rubber-black mixture has been studied. Extrusion time at 0.2% moisture is more than 30% greater than the time at 4% moisture. This effect is larger than is to be expected on the basis of the decrease in carbon loading resulting from the increase in moisture content.

Results on several samples of carbon black are reported and water vapor adsorption isotherms are compared with the extrusion vs. moisture curves.

The effect of moisture content on tensile, modulus, abrasion, aging, and extrusion of a tread stock has been studied. Tensile and modulus both tend to decrease as moisture content increases from 0.1 to 4%. Modulus at 400% elongation decreases at the rate of about 70 pounds per 1% increase in moisture content of the carbon black. Other experiments show that the decrease in carbon loading corresponding to a 1% increase in moisture content of the carbon black causes a decrease in modulus of only 35 pounds. Likewise the behavior of the tensile at optimum cure vs. moisture content curve cannot be explained exclusively on the basis of variation in carbon loading.

By keeping the moisture content of a standard control black constant, the reproductibility of modulus and tensile results was appreciably increased. When no particular precautions were taken to control the moisture content of the black, average deviations from the mean value of modulus at 400% elongation and tensile at optimum cure for 17 tests on identical tread stocks are 75 and 105 pounds per square inch, respectively. When the moisture content was regulated at 3%±0.1% these deviations decreased to 50 and 40 pounds, respectively. Suggestions are made for equilibrating carbon black at constant humidity in order to avoid a possibly troublesome source of variation in rubber testing. Leonard H. Cohen and C. R. Johnson, Continental Carbon Co., New York.

Rapid Determination of the Specific Gravity of Plastic Materials. The specific gravity of a plastic material is indicated directly by a machine as a result of the controlled compression of a known weight of sample. The specific gravity of vulcanized reclaimed rubber or rubber compounds may be determined in approximately one minute. Henry F. Palmer and Warren E. Jones, Xylos Rubber Co., Akron.

The Determination of Zinc in Rubber Compounds. A New Internal Indicator Method. In view of the difficulties encountered with the uranyl acetate external indicator method for the determination of zinc in rubber ash by volumetric precipitation with ferrocyanide, an investigation was undertaken to find a more rapid and more accurate method.

In the course of the investigation it was found that if the sample contains silicates or lead, the usual ashing procedure leads to the formation of compounds with the zinc which are not decomposed by acid treatment, thus giving very low results. The best method found for destroying the rubber was oxidation with nitric acid, bromine, fuming nitric acid, and perchloric acid.

After the oxidation of the rubber, volumetric precipitation with ferrocyanide was successfully used in the presence of ferricyanide and an internal indicator. Diphenylbenzidine will not function properly under these conditions, but a lesser known indicator, *p*-ethoxy chrysoidine, proved to be very satisfactory when back titration was employed. The proper conditions were also found for the determination of zinc in the ash, in the absence of silicates and lead, using either of the above-mentioned internal indicators.

It is not necessary to remove lead with hydrogen sulphide when the acid digestion method is used. Iron must be removed, but no other ions commonly found in rubber compound ash will interfere. The average precision for routine analysis is ±1%. The average accuracy is better than 1% deviation from the true value. The method is capable of application to the determination of zinc in other organic and inorganic materials. W. P. Tyler, B. F. Goodrich Co., Akron.

Holt and Viles Discuss Rubber Situation at N. Y.

ON MARCH 21 over 200 members and guests, attending the late afternoon meeting of the New York Group, Rubber Division, A. C. S., at the Building Trades Club, 2 Park Ave., New York, N. Y., heard the present rubber situation very ably discussed and witnessed a demonstration and explanation of the manufacture of sandpaper and fabrics by "Electrocoating." Following dinner, the new motion picture, "Goodyear Shoulders Arms", was shown through the courtesy of The Goodyear Tire & Rubber Co.

E. G. Holt, chief, Leather and Rubber Division, Bureau of Foreign and Domestic Commerce, stressed the importance of rubber in our national economy, and after briefly reviewing 1940 consumption of crude rubber, reclaim, and synthetics (estimated at between 4,000 and 5,000 tons) and discussing the rubber supply and transportation, he stated that it was imperative that Middle East production and exports be maintained as plantations in the Western Hemisphere to supply our needs could not be established in less than 12 years.

While our stock position was improved last year, Mr. Holt states that much crude rubber could have been saved by using a larger percentage of reclaim and by more extensive retreading. He said that there was probably enough available scrap to produce 500,000 tons of reclaim annually for five years or all that could be used efficiently.

Pointing out that synthetic rubber production is now largely rationed for special use, Mr. Holt enumerated arguments for and against expanded capacity. Those in favor were: certainty of supply; quickest nearby supply; independence of imports; easy defense; ample domestic raw materials; use of American labor; and present trend toward synthetic materials. The arguments against as cited were: necessary priorities on steel and machinery, already at capacity; two to four years for completion; limited experience and personnel available; probable rapid obsolescence; probable uneconomic comparison with natural rubber; and a cost of financing as great as that of the entire rubber manufacturing industry.

A. L. Viles, president of The Rubber Manufacturers Association, Inc., and chairman of the purchasing committee of the Rubber Reserve Co., in discussing the accumulation of government-held rubber and its relation to consumption, stated that in addition to the first two agreements with the International Rubber Regulation Committee calling for 330,000 tons of rubber, a third provisional agreement stipulating an additional 100,000 tons now awaits I.R.R.C. final approval. He said that crude rubber producers, aware of synthetic competition, were able to increase the rubber yield to between 1,200 and 1,800 or 2,000 pounds per acre and that it is actually being done in some instances. Also there was the possibility of modifying rubber to give it many of the properties of synthetics. Predicting that the use of both synthetic and natural rubber will continue in increasing quantities with the development running along parallel lines, Mr. Viles said that reports from various sources indicated that plans were being considered which would increase the capacity for synthetic rubber production and that it was hoped that current needs would soon be fully supplied.

J. O. Amstuz, chief engineer, Behr-Manning Corp., in a paper illustrated by motion pictures described the "electrocoating" process, which consists essentially of passing an adhesively treated backing sheet simultaneously through an electrostatic field and over particles of abrasive or fibers of rayon, wool, cotton, etc. The particles, charged by induction, pass upward against gravity to become embedded in the adhesive. The electrostatic process tends to orient and space properly the particles. Norson fabrics produced by this method have 250,000 fibers per square inch and utilize latex and rubber cements as adhesives, according to Mr. Amstuz, who produced sandpaper and velvet on a small table demonstrator. Designs in different colors are obtained by using stencils.

Chicago Group Elects Officers; Hears Arnold Smith on Europe

H. A. WINKELMANN, of the Dryden Rubber Co., was elected chairman of the Chicago Group, Rubber Division, A. C. S., at a special dinner meeting of Friday, March 14, at the Eitel Field Bldg. Restaurant, Chicago, Ill. Other officers elected for the ensuing year are: vice chairman, Calvan Yoran, Featheredge Rubber Co.; secretary, Ben W. Lewis, Wishnick-Tumpeer, Inc.; executive committee, C. E. Frick, Van Cleef Brothers, L. J. D. Healy, consulting chemist, J. Kirschner, Dryden Rubber, Charles Leiter, Inland Rubber Corp., and O. J. Urech, Samuel Bingham's Sons Mfg. Co.

The speaker for the evening was Arnold H. Smith, of the Monsanto Chemical Co., who will be remembered as an officer of the Rubber Division in its early years and who went to Europe in 1929 to establish and promote the manufacture of rubber chemicals at the Ruabon, North Wales, factory of Monsanto, returning to this country in June, 1940. Mr. Smith spoke to the group on "The Manufacture of Rubber Products in Europe Today", pointing out in a general way some of the outstanding differences in rubber production in European rubber factories as contrasted to American practice. According to the speaker, Europe was ahead of this country in the production of sundries and toys, but was behind in the manufacture of industrial rubber products. Comments were made on South American trade, which emphasized the normal advantages that European countries had over the United States in this respect. Mr. Smith also expressed his views on the political situ-

ation in Europe, particularly as it relates to the future of the United States. Following the address, a number of questions were presented from the floor, chiefly relating to synthetic rubber.

The new group chairman, Dr. Winkelmann, announced that more members would be asked to take part in the activities of the Group this year. An outstanding program has been arranged for Friday night, May 2, featuring a Symposium on Synthetic Rubbers and a display of manufactured rubber products from manufacturers in the Chicago area. Complete details will be sent to members shortly.

L. A. Group Meeting

THE regular monthly meeting of the Los Angeles Group, Rubber Division, A. C. S., was held on Tuesday evening, March 4, at the Hotel Mayfair, Los Angeles, Calif., with 105 members and guests present.

Geoffrey F. Morgan, lecturer and humorist, gave an interesting talk on "The Story of the Douglas Aircraft Co.", tracing its development from a modest beginning in the rear of a barber shop to an industrial giant employing 23,000 men and having a weekly payroll of $750,000. Robert M. Mallett, of the Lockheed Aircraft Co., presented that firm's recently completed motion picture, "Look to Lockheed for Leadership."

The door prize, an electric clock donated by L. H. Butcher Co., was won by Mason Paine (Firestone); while J. H. Thorne (Goodyear) won a portable radio, donated as a special prize by United Carbon Co.

Committee D-11 Active During A.S.T.M. Committee Week

THE 1941 Committee Week and Spring Meeting of the American Society for Testing Materials, held in Washington, D. C., March 3 to 7, inclusive, at The Mayflower Hotel, was marked by two important symposiums, a record number of committee meetings, and by the registration of more than 1,000 materials engineers and testing experts.

Committee D-11 on Rubber Products

Committee D-11 on Rubber Products, under the chairmanship of O. M. Hayden, E. I. du Pont de Nemours & Co., Inc., decided to submit to letter ballot proposed new methods of test for automotive air brake and vacuum brake hose, resulting from work by Technical Committee A on Automotive Rubber. Subcommittee II on Belting recommended that the Method of Testing Rubber Belting (D 378-40T) be adopted as standard; while another group recommended that the specifications for rubber gloves (D 120-40) be submitted to the American Standards Association for approval.

The Subcommittee on Wire recommended that a change be made in the Table on Thickness of Insulation appearing in three standards, D 27, D 353, and D 469, to include sizes No. 16 and 18, A.W.G. for the 0 to 600 voltage classification. The following tentative specifications and methods are to be recommended for adoption as standard, subject to letter ballot: (D 27-40T) Insulated Wire and Cable: Class AO, 30% *Hevea* Rubber Compound; (D 353-40T) Insulated Wire and Cable: Performance Rubber Compound; (D 469-40T) Insulated Wire and Cable: Heat-Resisting Rubber Compound; (D 532-39T) Rubber Sheath Compound for Electrical Insulated Cords and Cables; and (D 470-40T) Methods of Testing Rubber Insulated Wire and Cable.

The program of Subcommittee VI on Packings included the following papers: "Experiences in Packing a Cellophane Casting Machine," by Wm. Staniar, du Pont; "Special Gaskets," John Boyer, du Pont; "The Effect of Operating Variables on Performance of a Typical Centrifugal Pump Packing," F. C. Thorn, Garlock Packing Co.; and "Tests of Packings for Refinery Services," G. W. Oxley, Standard Oil Development Co.

The tentative revision covering buffing of samples in the Standards Methods of Sample Preparation for Physical Testing of Rubber Products (D 15-39) is to be balloted on for adoption. It is proposed to revise the Tentative Methods of Tension Testing of Vulcanized Rubber (D 412-40T) to include, in addition to the present three die shapes, a new die ⅛ by one inch with ⅝-inch shoulders conforming to a similiar die prescribed in federal specifications.

The method for determining tear resistance (now a proposed draft) will be revised with respect to the number of nicks and specimen thickness and shape. These changes are to be completed for inclusion as tentative in the 1941 report. The subcommittee on abrasion tests decided to undertake work to determine the possibility of correlating the results obtained with the du Pont and Bureau of Standards machines. Abrasion tests for evaluating marine decking compounds will be investigated.

A cooperative program by eleven laboratories has been arranged for comparing the results of accelerated aging tests with 80° C. and 70° C. bomb temperature. The Tentative Method of Test for Resistance to Light Checking and Cracking of Rubber Compounds (D 518-38T) will be continued as tentative because the exposure rack may be changed. The Proposed (draft) Methods of Accelerated Light Test Methods and Calibration of Light Sources are to remain essentially as at present. The committee will undertake tests using different types of light sources (flaming arc, mercury vapor lamp, etc.).

The Tentative Method of Test for Indentation of Rubber by Means of the Pusey and Jones Plastometer (D 531-39T) is to be recommended for adoption. Progress was reported on hand hardness testers (Durometers). Subcommittee XVIII on Dynamic Fatigue Testing for Rubber Products considered the effect of variables in compounding on the results obtained in six recognized compression, flexing, and heat build-up tests on eight compounds. Procedures for heat build-up testing by using compression flexing will probably be ready for presentation as tentative.

Subcommittee XXIII on Hard Rubber presented Proposed Methods for Asphalt Composition of Battery Box Containers and reported that extensive tests, based on Tentative Methods of Testing Hard Rubber Products (D 530-39T), were conducted with the view of improving these methods.

A new Subcommittee on Standardizing Methods of Tests Applicable to Rubber Products Manufactured by Coating Fabrics with Rubber and Rubber-Like Materials has been authorized. A. F. Schildhauer, of du Pont, heads the new group, and an organization meeting will probably be held in June.

Plastics and Insulating Committees

The activities of Committee D-20 on Plastics covered essentially: impact and tensile strength; scratch hardness; deformation under load at elevated temperatures; mar resistance; improvements in flammability tests; softening point and flow temperature measurements; optical properties, including clarity and surface brightness; resistance to light and heat; and water vapor permeability. The committee was also concerned with laboratory test conditions.

Committee D-9 on Electrical Insulating Materials announced four proposed new tentative standards for submission to letter ballot, including: a specification on phenolic tubes for radio use; test methods on volatile content of vulcanized fiber; sludge determination in insulating oil; and measurement of mica stamping in radio tubes and incandescent lamps.

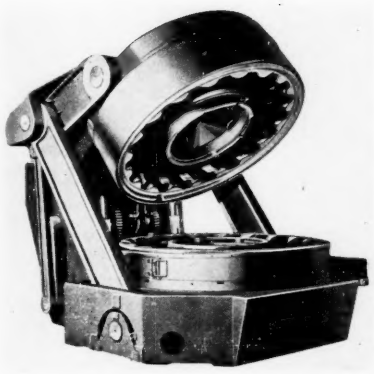
Two Symposiums

Seven papers comprised the "Symposium on New Methods for Particle Size Determinations in the Subsieve Range": "The Shape and Surface of Fine Powders by the Permeability Method", P. C. Carman, University of Capetown; "Surface Area of Portland Cement", P. S. Roller, U. S. Bureau of Mines, and P. V. Roundy, Jr., American Instrument Co.; "Methods for Determining Particle Size Distribution", L. T. Work, Metal & Thermit Corp., and H. E. Schweyer, Columbia University; "RCA Electron Microscope", James Hillier, RCA Mfg. Co.; "The Adsorption of Pigments", W. W. Ewing, Lehigh University; "A New Method for Measuring the Surface Areas of Finely Divided Materials and Its Use in Determining the Size of Particles", P. H. Emmett, John Hopkins University; and "The Determination of Subsieve Particle Size Distributions by Sedimentation Methods", S. W. Martin, National Lead Co.

The six papers comprising the "Symposium on Color—Its Specification and

(*Continued on page* 90)

New Machines and Appliances



Truck and Tractor Tire Vulcanizer

National Tire Vulcanizer for Truck and Tractor Tires

THE National Model E-75-28-350 vulcanizer for truck and tractor tires is of the electrically operated automatic stripping type and is designed to accommodate both integral and pot-heater-type molds. With the integral-type mold, steam is supplied directly to the jacket of the mold; while in the case of the pot heater mold, either of two methods of heating may be employed. In one method the steam is supplied through a shell or dome surrounding the mold; while the second method requires the use of steam platens, a stationary bottom platen and a top platen which is adjustable to accommodate molds of different thicknesses. Insulated shields completely surround the mold and platens to retain the heat during cure.

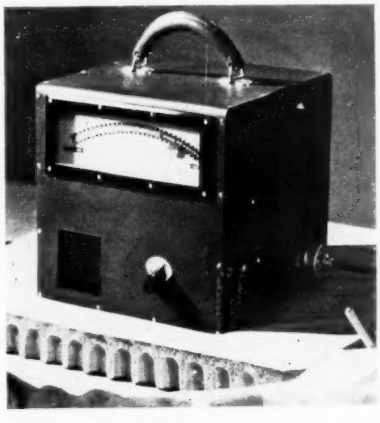
Rotating parts are equipped with frictionless bearings or oversized bronze bushings. All main castings are of steel, and the base is fabricated with an undercut at the front to provide toe room for the operator. The gear and pinion drive is powered by a geared head motor, equipped with a double end takeoff shaft. Each shaft carries a pinion and is supported outside of the pinion by outboard bearings. The pinions are engaged in the main drive gears which operate the crank; while bearings close to the gear, and crank reduce overhang. Stripping action is accomplished by cams, so designed that water or air bags may be cured if desired.

The press weighs 26,000 pounds, without molds, and will accommodate molds up to 74 inches outside diameter. Time for closure or opening of the press is 15 seconds. National Rubber Machinery Co., Akron, O.

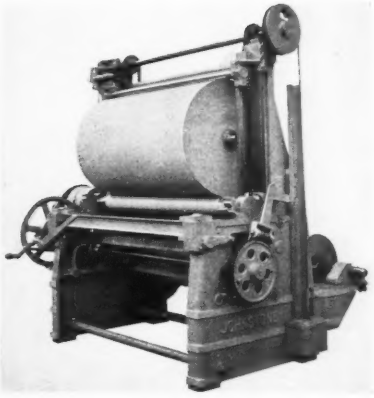
Tight Press Fit Given to Bearings

A NOVEL method, announced by The Timken Roller Bearing Co., Canton, O., has been developed for heating bearing cones preparatory to assembling them on shafts where a tight press fit is required. The method utilizes the device illustrated, which consists of three trays about four inches square and spaced approximately 12 inches apart. The middle tray is of pyrex glass; while the top and the bottom trays each carry seven 250-watt infra-red ray bulbs with gold-plated reflectors. Bearing cones are stacked on the glass shelf in their containers. About 20 minutes are required to heat a bearing up to a maximum of 155° F. The infra-red rays penetrate the boxes, heat the steel, but leave the cardboard relatively cold. When this method of heating is used, it is not necessary to wash off the protective coating put on the bearings at the time of packing.

Infra-Red Ray Apparatus for Heating Bearings



Goodrich Air-Flo Meter



Johnstone Slitter and Rewinder

Slitter and Rewinder Handles 32- to 82-Inch Rolls

THE Johnstone slitter and rewinder, which is built in two models, the Twelve and a heavier and faster machine, the Fourteen, will slit and rewind paper, rubber and fabrics of practically all kinds, including imitation leather and rubberized fabrics, with straight, pinked, or special edges. The Twelve will take rolls from 32 to 62 inches wide and operate at a maximum speed of 700 feet per minute. The Fourteen, which accommodates thicker materials, will handle rolls from 42 to 82 inches wide, with a maximum speed of 1,500 feet per minute. There are ten slitter levers with spacers to suit slitting requirements.

Of modern design, the new machine is usually equipped with score cut slitters, or for certain materials and conditions, shear cut slitters. In the cutting operation the rounded V-edge score cut slitter wheels press the web against a hardened steel roll. The slitter mechanism features tool steel levers, wheels with sealed ball bearings, underpoint springs, gliding pressure adjustment, and a boomerang pressure release lever which assures that the slitters always return to the same adjustment. The rewinding mechanism utilizes the drum-winding method, with all three driving rolls mounted in roller bearings. Other features claimed for the machine are: dual-purpose clutch control that combines brake with shifter, floating pressure roll drive, and hinged, split brake straps and mill roll clamp to facilitate roll changing. Johnstone Engineering & Machine Co.

Porosity Testing Machine for Latex Sponge

THE Air-Flo Meter, designed especially for latex sponge products, indicates the relative rate that air can be drawn through a porous material under

(*Continued on page 63*)

New Goods and Specialties

Rubber-Lined Valve for Steel Pickling Tanks

FURTHER improvement in the method of handling acids used in steel pickling operations is said to result from a new combination rubber-lined outlet and overflow valve for pickling tanks. The new product is a modification of the rubber-lined Vulcalock valve, covered by United States patent No. 1,947,257.

As shown in the drawing, the valve is installed entirely on the outside of the tank and uses a wheel and screw attached to the valve stem to raise and lower the valve disk. Completely rubber lined, the new valve is fitted with a replaceable, resilient, rounded disk which snaps over a circular plate at the lower end of the stem and provides an absolute seal when brought into contact with the rubber-covered seat ring. Provision is made for automatic overflow at a predetermined level, thus maintaining constant liquid level in the tank. Among the principle advantages cited for the new development are the ease and rapidity with which the valve can be operated and the solutions completely drained from the tank; any accumulated sludge is carried away completely with a minimum of flushing. The B. F. Goodrich Co., Akron, O.

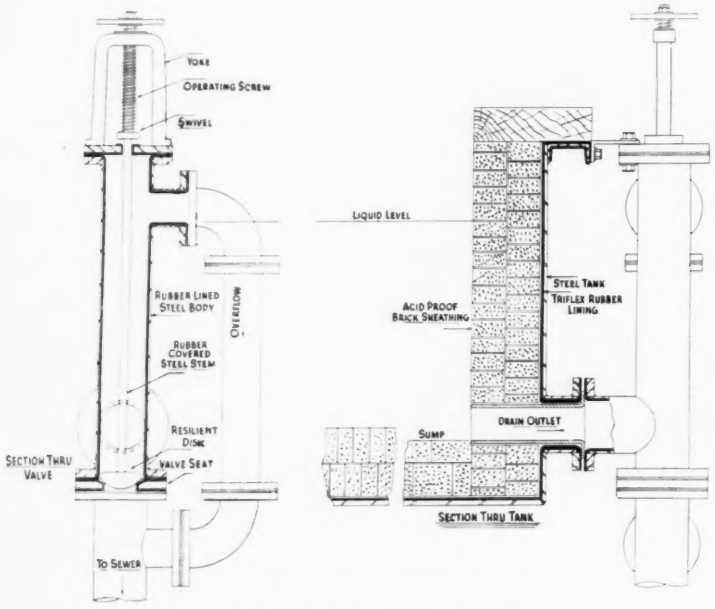


Diagram of Rubber-Lined Pickling-Tank Valve

Loxal Covered Rubber Thread

LOXAL is a rubber thread with a covering of nubbed yarn. The thread, when woven into a fabric, will not slip back or pull out because of the obstruction furnished by the regularly spaced nubs on the cover, it is claimed. Loxal is particularly advantageous when used in underwear elastic belting and certain types of women's hosiery supporters. United Elastic Corp.

Auto Coin Device

THE all-rubber Auto-Cash device, illustrated, is designed for attachment to automobile windshields or dashboards and will hold several coins readily accessible for the payment of bridge tolls, parking charges, etc. The device is made of two molded parts, a suction cup base and a coin holder which snaps on to the base. Le Roco, Inc.

Non-Collapsible Radiator Hose

UNI-CURVE radiator hose for automobiles is a non-collapsible type with an integral wire insert to prevent any tendency for the hose to fold and stop water circulation. The Uni-Curve also is said to do away with the customary use of spring inserts in making hose applications. The six sizes of Uni-Curve, ranging from $1\frac{1}{4}$ to two inches, will replace more than 150 sizes of molded hose connections, it is claimed. The Goodyear Tire & Rubber Co.

Vacuum Cup Holder

THE Red Devil vacuum cup holder or lifter shown here is said to be capable of holding as much weight as a strong man can lift. The device literally puts a handle on glass, marble, granite, and other smooth-surfaced articles the weight of which normally makes lifting, pushing, or carrying awkward and difficult.

Red Devil Lifter

The holder consists of a $\frac{1}{8}$-inch thick disk of tough rubber connected by means of a central post to a lever. After the device is placed on a smooth surface, the lever is clamped down, raising the center pin to create a strong vacuum at the center of the rubber disk. Landon P. Smith, Inc.

Le Roco's Auto-Cash

Installing Uni-Curve Hose

UNITED STATES

Defense Needs Threaten Civilian Uses

Industrial activity in general remained at record levels mostly due to our national defense program and the anticipated effects of the lease-lend bill. Some concern is evinced as to how arming will affect output in lines for normal use. Already delayed deliveries, the rationing of raw materials, and the shifting of labor to defense channels are being felt. In many businesses, however, output is near capacity; orders are gaining over deliveries, and backlogs are growing.

Although there is a shortage of skilled employes in certain trades, unemployment is still a serious problem and threatens to become more acute as workers in fields supplying civilian wants from materials needed for defense, as aluminum household goods, are made idle because of the scarcity of raw materials. Labor troubles also are increasing.

Last month rises occurred in the cotton mill rate, oil and rayon output, and steel production, which reached 99.8% of theoretical capacity. But fluctuations were more the rule in weekly schedules, as for paper, lumber, power, and paperboard output and carloadings. Machine tool production advanced beyond the February peak, and shoe output likewise was reported well above the previous month's figure and that of March, 1940; while the glass industry for the past three months has been running at or near capacity. Electrical appliances and household wares are being sold so quickly that stores cannot maintain sufficient stocks. The cotton textile industry, which last year set a record, believes that 1941 will prove substantially better if present operations are maintained. Piano sales to date are 15% ahead of 1940, which was the best year since 1927.

Automobile production last month dropped, except for the week of March 10 when output at 131,410 units was the best since May 15, 1937. This contra-seasonal decline was partly attributed to the blizzard and minor parts and materials shortages. It is also felt that some decrease in automobile output may soon take place because of national defense requirements. In fact dealers already are studying how to meet the problem of curtailed new car and truck production for normal uses when the public has increased purchasing power. Retail sales for the past six months are about as high as in the peak six-month period of 1929.

The rubber manufacturing industry in March was reported to be maintaining its high rate of operations, with rubber consumption expected at a record level, although minor declines were noted in battery boxes and certain mechanical goods. Shipments of rubber products recently dropped somewhat, but manufacturers' inventories gained noticeably.

EASTERN AND SOUTHERN

National Income at Record High, But Less per Person and Family

The Conference Board, 247 Park Ave., New York, N. Y., has estimated that for 1940 realized national income, that is, money payments to individuals, mostly as wages, salaries, professional fees, dividends, interest, rents, and royalties, totaled approximately $72 billion, the greatest since 1930 and 4.9% above the 1939 figure, but about $7.5 billion under the all-time high of $79.5 billion for 1929. However if the total realized national income is adjusted for changes in the cost of living, the resulting real income last year, using 1926 as a base period, was the highest on record, $87.9 billion, against $82.8 billion in 1929.

Owing to the increase in population and the number of families, though, on a per capita basis the showing was less favorable. The 1940 per capita income, unadjusted for changes in living costs, was $545, about 17% lower than in 1929, and the real income per person, giving effect to cost-of-living changes, was only 2.2% less. Last year realized national income per family averaged $2,275, against $2,894 in 1929 and $3,044 in 1920. For 1940 real income per family was also lower than in the war year 1917 and in the pre-war period 1906-1910.

Unemployment up in January

The Conference Board has likewise estimated that in January unemployment in the United States rose to 7,664,000 from 6,935,000 in December. This decline, which is seasonal, was partly due to the laying off of the larger number than usual of workers hired for the Christmas season. Other declines occurred in construction, manufacturing, transportation, and public utilities, although these decreases were partly offset by greater numbers employed in agriculture and the service industries.

Employment the past January totaled 47,757,000, compared with 48,439,000 in December, 48,261,000 in November, and 45,606,000 in January, 1940, and was also 168,000 below the 1929 average, but 11,873,000 more than the low of March, 1933.

CALENDAR

Apr. 1.	Los Angeles Rubber Group. Mayfair Hotel.
Apr. 1-3.	A.S.M.E. Spring Meeting. Atlanta, Ga.
Apr. 10-11.	Rubber Division, A.C.S. Spring Meeting. Mayfair Hotel and Hotel Statler, St. Louis.
May 1.	Buffalo Rubber Group and Ontario Rubber Section. Joint Meeting. General Brock Hotel, Niagara Falls, Ont., Canada.
May 1-3.	American Physical Society. Washington, D. C.
May 2.	Chicago Rubber Group.
May 6.	Los Angeles Rubber Group. Mayfair Hotel.
May 19-21.	American Institute of Chemical Engineers. Edgewater Beach Hotel, Chicago.
May 22-23.	Association of American Battery Manufacturers, Inc. Spring Meeting. Hotel Statler, Detroit.
May 26-29.	National Association of Purchasing Agents. 26th Annual International Convention and Inform-a-Show. Stevens Hotel, Chicago.
June 1-6.	SAE. Summer Meeting. The Greenbrier, White Sulphur Springs, W. Va.
June 19-21.	Wilbur D. Bancroft Colloid Symposium. Cornell University, Ithaca, N. Y.
June 23-27.	A.S.T.M. Annual Meeting. Palmer House, Chicago.

In computing employment figures the Board excludes W.P.A. and C.C.C. rolls, which rose by 41,000 for January, but were 418,000 below January, 1940.

President F. D. Roosevelt last month signed three proclamations putting 16 more articles under the export licensing system and requiring export permits for "plans, specifications or technical information utilized in connection with the production or processing of any of the items under control." Included are carbon black, fatty acids produced from vegetable oils under export control, and pine oil.

The United States Department of Commerce, Washington, D. C., has announced the resignation as director of the Bureau of Foreign and Domestic Commerce of James W. Young to become director of communications for Nelson A. Rockefeller, coordinator of commercial and cultural relations with the American republics.

The United States Department of Agriculture, Washington, D. C., for the second time sent by air to the Brazilian Government rubber seedlings for experimental planting in the Amazon Valley. The shipment, which arrived at Belem on March 24, was carried by six United States B-18 bombers.

U. S. Rubber Pays Common Dividend after 20 Years

United States Rubber Co., 1230 Sixth Ave., New York, N. Y., according to F. B. Davis, Jr., chairman and president, at a directors' meeting March 5 declared a dividend on its common stock. The last previous payment was on April 30, 1921. In December, 1938, after an 11-year lapse, the company resumed dividends on its non-cumulative preferred stock.

Mr. Davis stated that owing to steadily improving business and the defense program, the company's plants, making more than 50,000 different rubber products, are working at capacity on the largest back-log of unfilled orders in its history.

Since Mr. Davis became the company's chief executive January 15, 1929, the management has eliminated a number of factories and has reduced to 29 the 123 separate subsidiary corporations which then existed.

The funded debt and bank loan were cut from $130,000,000 to $41,000,000 of first mortgage bonds. The company is the world's largest owner of rubber plantations, and through these, which have a net book value of $19,983,000, has improved its financial position; profits resulting therefrom have more than repaid their cost.

United States Rubber Co. was organized March 29, 1892. Of its original 15 plants, only two, one established in 1843, the other 1844, both under licenses from Charles Goodyear, are extant and form the Naugatuck, Conn., footwear plant. In 1907 U. S. Rubber acquired control of Canadian Consolidated Rubber Co., Ltd., which today, as Dominion Rubber Co., Ltd., is a leading rubber manufacturer in Canada. In 1911 the parent organization purchased the Naugatuck Chemical Co., established 1904. A rubber reclaiming plant at Naugatuck operates as part of the Naugatuck Chemical Division. In 1912 U. S. Rubber's research and development activities were centralized in a Development Department, with General Laboratories in New York, which were later moved to Passaic, N. J. United States Rubber Export Co., Ltd., was formed November 23, 1914, to consolidate the export business of all subsidiaries. Branches appear in six South American nations, Cuba, Puerto Rico, Mexico, the Philippines, South Africa, New Zealand, England, Sweden, and Hong Kong. The parent company also produces in its own plants, at Winnsboro, S. C., Hogansville, Ga., Shelbyville, Tenn., and New Bedford, Mass., cotton and rayon tire cord fabrics for mechanical goods and light weight asbestos fabric.

The company always appreciated the importance of growing its own rubber. In 1903 concessions were obtained in Brazil, but not developed. In 1910 the company bought holdings in Sumatra and started planting, later followed by plantations in Kedah, Selanger, and Johore, native states in British Malaya. Today U. S. Rubber has 104,232 acres in the residencies of Sumatra East Coast and Langkat and 30,821 acres in Malaya, of which 102,236 have been planted. Production last year reached 29,018 long tons. Mature trees cover 89,380 acres, and an average yield of 741 pounds an acre, a new high, was achieved in 1940.

Wage Adjustments Made

Last month Philip B. Fleming, administrator of the Wage and Hour Division, United States Department of Labor, Washington, D. C., announced that adjusted wage payments totaling about $50,000 are being made to more than 200 U. S. Rubber employes as a result of a study conducted by the company to determine proper classification of its workers. About ¼ of 1% of the company's 42,000 employes will receive restitution payments in amounts varying from a few cents to more than a thousand dollars in a few instances; practically all are in the "white collar" class.

C. S. Ching, director of industrial and public relations, initiated the survey last October when revised regulations were issued by the Division covering the classification of workers exempt from the law as executives, administrative, and professional employes, or outside salesmen. Information relative to individual cases was furnished by General Fleming, whose office cooperated closely with the rubber company. Mr. Ching, who realized there were some misclassifications when the survey began, now feels that the company is in full compliance with regulations covering all types of work.

Safety Contest Winners

Mr. Davis on March 12 announced the winners of the U. S. Rubber Co. Safety Contest for 1940. This was the seventeenth consecutive year of the contest, and prizes are awarded on the basis of improvement over the previous three-year average. Winners follow:

Larger Plants: President's Prize of $300, Naugatuck, Conn., footwear plant; second prize of $150, Providence, R. I., plant; and third prize, $75, Los Angeles

Smaller Plants: President's Prize of $100, Shoe Hardware Division, Waterbury; second prize, $75, General Development Division, Passaic, N. J.; third prize, $50, Naugatuck Chemical plant.

The past year saw the lowest severity rate in the history of the company. Ernest W. Beck is supervisor of safety.

Bike Tire Output

U. S. Rubber on February 17 at its Indianapolis, Ind., plant completed its 71st million bicycle tire, a U. S. Royal Rider built of rayon. Witnessing the event were F. J. Schoettle, in charge of sales production coordination; John Cady, director of development; Noel Lanham, head of the bicycle tire development department; and T. E. Clark, factory manager.

"Time-to-Re-Tire" Boy Restored

This marks the thirty-fifth year of the use of the famous Fisk "Time-to-Re-Tire" boy trade mark, which is to be featured in an April advertising campaign announcing a new Fisk Safti-Flight tire with Safety Stripe Tread. Through the many years of retouching the "boy" has undergone severe change including the replacement of his yawn and one-piece pajamas for a smile and modern garments including slippers. In 1934 the original painting was again retouched to restore the original concept. Now after submission by U. S. Rubber to a number of nationally known artists for a new sketch, a unanimous report was made that they could not recapture the charm of the original painting from the pencil sketch made in 1907 by Burr Griffin. Consequently the oil painting was completely restored by artist Edward Eggleston, who died recently.

Tom Young, U. S. Rubber Director of Advertising, and J. Cochran, Account Executive of Campbell-Ewald Co. of N. Y., Inc., Inspecting the Restored Painting of the Fisk "Time-to-Re-Tire" Boy

Personnel Activities

On March 19, President Roosevelt created an eleven-man National Defense Mediation Board "to assure that all work necessary for national defense shall proceed without interruption and with all possible speed." Three members represent the public, four the employes, and four, employers. Mr. Ching, who also acts as an agent for the Office of Production Management, was named to the last group.

Mr. Ching addressed the March 18 meeting of the Purchasing Agents Association of New York, 120 Broadway, New York, at which new officers were installed as follows: president, Thos. I. Savage, Murphy Varnish Co.; vice president, Walter E. Cummin, White Laboratories; executive committee member, James L. Crosbie, Dexter Folder Co.

U. S. Rubber last month appointed J. C. Bird as sales representative for its electrical wire and cable division in the Seattle district. His organization, Electric Agencies, will be at 2207 First Ave. S., Seattle, Wash. Mr. Bird, who has a wide experience in this field, is an associate member of the A. I. E. E.

W. W. Cowgill, of U. S. Rubber's defense committee, on March 18, in addressing the American Society of Mechanical Engineers' Metropolitan Rubber Division, explained, with specific examples, how rubber has become of utmost strategic value to the national defense program.

Victor Products Corp., Hagerstown, Md., has been operating a reclaim plant there for the past several years and during the past year also manufactured mechanical rubber goods. The plant at Gettysburg, Pa., recently purchased from The O'Sullivan Rubber Co., Inc., will be operated in conjunction with the reclaim and mechanicals plant at Hagerstown. Officers of the Victor company follow: president, R. J. Funkhouser; vice president and treasurer, R. P. Funkhouser; secretary, R. M. Hoffman; assistant treasurer, J. K. Wheeler; assistant secretary, R. S. Beck. The firm maintains branch offices at 366 Madison Ave., New York, N. Y.; 111 N. Canal St., Chicago, Ill.; 315 Spring St., N. W., Atlanta, Ga., and 7352 La Veta Ave., St. Louis, Mo.

Puritan Rubber Mfg. Co., Trenton, N. J. is very busy filling orders for rubber tiling. Robert G. Marcus, secretary and sales manager, recently returned from a lengthy business trip on the Pacific Coast.

Nearpara Rubber Co., reclaimed rubber concern, Trenton, N. J., has completed rebuilding two one-story structures recently destroyed by fire.

Mercer Rubber Co., Hamilton Square, N. J., is operating at capacity. President Wm. H. Sayen, Jr., who recently completed a business trip to Houston, Tex., reports the rubber business is in a healthy condition.

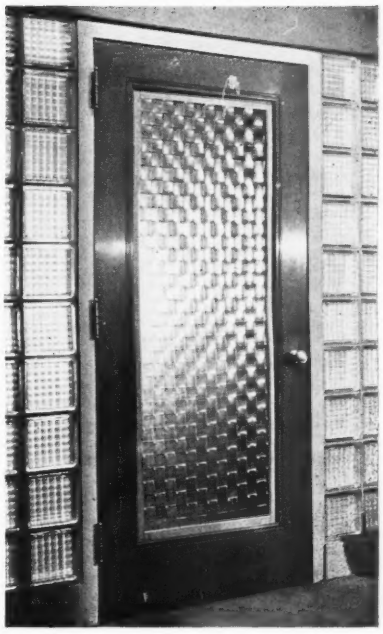
Railway Express Agency, Inc., 230 Park Ave., New York, N. Y., along with several other large corporations is equipping certain light units of its motor truck fleet with synthetic rubber tires and thus is participating in a voluntary movement to encourage the development of a "stand-by" synthetic rubber industry capable of emergency expansion. To acquaint its officials and employes with this new development, Railway Express has distributed among its various districts tires made of Ameripol.

OPM Announcements

Office Production Management, Washington, D. C., on March 7 through Edward R. Stettinius, Jr., director of priorities, in the interests of national defense and its needs, ordered mandatory priorities on all supplies of neoprene, the synthetic rubber made by E. I. du Pont de Nemours & Co., Inc., Wilmington, Del., which by October expects to produce 1,500,000 pounds of neoprene a month. The present rate is 1,000,000 pounds. Since last fall, however, du Pont has considered the national defense program in making allotments of the synthetic.

The Priorities Division last month announced that a plan whereby the Division can instruct each zinc producer to set aside 5% (for April, and subject to change for succeeding months) of his total production, thus creating a pool of the metal which can be promptly allocated by the Division to alleviate shortages as they may arise in defense industries.

On March 18, Mr. Stettinius produced a list of "critical" items enumerating materials and supplies on which the Army and Navy field services may automatically assign priorities rating. This Priorities Critical List includes, besides aluminum, magnesium, machine tools, neoprene, and nickel—the five materials on which Mr. Stettinius has decreed industry-wide priorities, also: observation or barrage balloons, roller and ball bearings, power plant and heating boilers, bridges (foot, portable steel, and pontoon), electric cables, flying and chemical protective clothing, diving apparatus, gas-decontamination apparatus and equipment, interphone equipment, first-aid kits, gas and oxygen masks, radio apparatus, synthetic rubber and rubber-like synthetic materials, submarine safety and escape devices, telephones, and wires.



Door of Laced Strips of Koroseal Leading to the Empire State Bldg. Showrooms of Comprehensive Fabrics, Inc., Which Is Merchandising the Synthetic through Licensees

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Clinton H. Crane and **Andrew P. Fletcher,** president and vice president and treasurer, respectively, of the St. Joseph Lead Co., 230 Park Ave., New York, N. Y., were injured in an automobile accident February 26 near St. Louis, Mo. Mr. Fletcher has resumed his duties with the company in New York, but Mr. Crane will be confined for some weeks to permit the healing of broken bones received in the accident. He is, however, progressing very rapidly.

Rubber Products Displayed at the Packaging Show

The Eighth Annual "5 & 10" Packaging Contest and Show took place March 12, 13, and 14 at the Hotel Astor, New York, N. Y., under the auspices of *The Syndicate Store Merchandising,* 79 Madison Ave., New York, and featured a three-day conference on packaging, merchandise displays, shipping, and allied problems.

Among the merchandise exhibited to show the contrast between the old-type and new packaging were the following rubber articles: dress shields; sink stoppers; Dr. Scholl's foot aids; cream-lined Hollywood Glamor Gloves of Josline, Inc., Hollywood, Calif.; coat shields and sport girdles made by the Rand Rubber Co., Brooklyn, N. Y.; Vassar Wavers, Anker-Kushins for lampshades, manufactured by W. N. de Sherbinin Adapters, Inc., Mt. Kisco, N. Y.; Cro-Pax Foot Aids, Forest City Rubber Co., Cleveland, O.; Peds, stocking savers, Richard Paul, Inc., Wilmington, Del.; plate, bowl, and pan scraper, Anderson Rubber Works, Anderson, Ind.; sanitary aprons, Red Star Co., Bridgeport, Conn.; bathroom fixtures with rubber suction cups and rubber-covered Peerless Snap-on Towel Bar and Tie Rack, Peerless Novelty Co., Grand Haven, Mich.; Doff & Don fabric-lined rubber gloves, Edmont Mfg. Co., Coshocton, O.; Pliofilm hat and head cover, Pliochez Co., Akron, O.; Hydrawlik moisteners and desk sets, Hydrawlik Corp., Roselle, N. J.; Carter's rubber stamp ink and rubber cement, Carter's Ink Co., Boston, Mass.; Three-Minute Egg Timer, Seed Filter & Mfg. Co., New York; and Kumfy non-slip sponge-rubber steering wheel cover, Faultless Rubber Co., Ashland, O.

Products of the Lower Rubber Mfg. Co., Ravenna, O., included baby teethers, play and teething necklace, and Nola Rubber Holder for brooms, dusters, mops, garden tools, etc. The I. B. Kleinert Rubber Co., New York, presented dress shields, shirt and garment grippers for men and women, girdle suspenders, and baby pants. The Auburn Rubber Corp., Auburn, Ind., which had three prize winners in the special Awards display, Fix-Fast Rubber Cement, play hammer and hatchet, and kitchen spa-

tula, also showed rubber soles and cement for attaching them, and Ice Creepers, cleated bands of rubber to wrap around shoe sole and instep to prevent skidding.

Among the many other prize winners were mentioned a transparent cap seal, E. I. du Pont de Nemours & Co., Inc., Wilmington; and a box base and transparent sheeting by Monsanto Chemical Co., St. Louis, Mo.

One of the exhibitors at the show was Thomas M. Royal & Co., Philadelphia, Pa., manufacturer of packaging materials, which featured Pliofilm and Pliofilm-lined paper bags for foodstuffs, including tea, coffee, dog food, soup mix, and malt.

Broadcast on Rubber in Defense

National Broadcasting Co., over its Red Network, comprising 83 stations and an estimated 25,000,000 listeners, on Saturday, April 5, from 7:00 to 7:30 p.m. E.S.T., in conjunction with the National Association of Manufacturers will present the non-commercial sustaining feature, "The Rubber Industry in Defense," from New York, Akron, and Washington, which will picturesquely and graphically illustrate major uses of rubber in defense and how the rubber industry is cooperating in the whole defense program. One of the features of the broadcast will be Graham McNamee broadcasting from a bomber over Radio City, New York, describing uses of rubber in aviation.

U. S. Rubber Reclaiming Co., 500 Fifth Ave., New York, N. Y., according to John S. Plumb, factory manager, has engaged as chief chemist at the Buffalo, N. Y., plant, Howard L. Wiley, who will be associated with Technical Superintendent M. L. Allard. Mr. Wiley's duties will consist of compounding and development as well as some field work in extending the use of the company's products. For the past fifteen years he was with the Gates Rubber Co., Denver, Colo., the first twelve as assistant chief chemist and then as chief chemist.

General Cable Corp., 420 Lexington Ave., New York, N. Y., on March 19 held its annual stockholders' meeting at Jersey City, N. J., at which J. R. MacDonald was elected a director to succeed C. R. Meyer, resigned. President D. R. G. Palmer reported that current unfilled orders are the largest on record and backlogs are gaining. The firm is operating at about 90% of capacity, and additional capacity for specialized units may be required.

Youngs Rubber Corp. of New Jersey, Trenton, N. J., will erect a one-story factory addition to cost $5,000.

Crescent Insulated Wire & Cable Co., Trenton, N. J., is very busy on war orders, but officials claim that costs of various materials advanced after contracts were let. Vice President C. Edward Murray, Jr., has been reelected president of the Trenton Country Club.

Rubber Playthings Attract Many at American Toy Fair

National defense dominated the annual American Toy Fair held March 10 to 29 in New York, N. Y., at the Hotel McAlpin and the Fifth Ave. Bldg., with about 450 exhibitors and 900 visitors. Many manufacturers emphasized display features and packages which in some instances formed an integral part of the plaything. Buying was considerably higher than during the 1940 show, and rubber companies were among those reporting the largest advance business booked. That the rubber industry was active at the Toy Fair may be seen from the following.

Anderson Rubber Co., Akron, O., in its line of balloons and dolls stressed the patriotic. One number, a giant dirigible, was a replica, with appended parts of paper, of the *Macon*. Two new toss-ups were Uncle Sam and big-earred Black Tom. Of interest were the balloons of silver latex in which the pigment was incorporated in the mix.

Auburn Rubber Corp., Auburn, Ind., presented miniature armies, navies, and air corps with all necessary equipment. Peacetime pursuits also were represented, by farm life, loaded wagons and teams, trucks, tractors, trailers, fire engines, and motorcycles. A feature of Auburn toys is that the cartons in which they are packed are adapted to form a suitable background for the playthings. Other toys were blocks, hammers, and hatchets. Likewise on display were fly swatters, heels, soles, cement, and jar openers.

The Barr Rubber Products Co., Sandusky, O. introduced several new lines; inexpensive rubber dolls including Raggedy Ann; a bunny; a Velour Ball; a 10¢ tennis ball; two new scented dog toys, a dumbbell and a Scottie head; and Noisy Rascals: Clown, Porky Pig, and Chinaman.

Collette Mfg. Co., Amsterdam, N. Y., showed juvenile sporting goods.

Eagle Rubber Co., Ashland, O., displayed balls, balloons, dolls, dog toys, and miniature latex novelties. Balloons took the shapes of dragons, cats, clusters, bread, milk bottles, stratoliners, and shoes.

Ideal Novelty & Toy Co., Inc., 23-10 43rd Ave., Long Island City, N. Y., in its large assortment of dolls showed one with head of plastic and body of Magic Skin (latex), as well as all-rubber models.

Balloons of many sizes, colors, and shapes formed the exhibit of Lee-Tex Rubber Products Corp., 904-12 Blackhawk St., Chicago, Ill. Unusual treatment was a series of rings formed around the balloon, presenting a corrugated surface. Other novelties included the Dumbbell, Knobs, Cactus, Screw Ball, Zoo-Toon toss-ups, and a life-size toss-up chirping chicken. Here again appeared the newly processed silver latex number. As a companion to the Barking Dog, the Quacking Duck made its bow.

Molded Latex Products, Inc., Passaic, N. J. (successor to the Kaysam Corp.), presented molded toys. Many new pets were added; a woolly lamb, a pony, a chick in a bonnet, and a kitten with a ball. All whistle, and two lines in sets consist of an elephant or duck and three youngsters. Another new specialty was the diving-shooting submarine, which like the spouting whale, floats, but sinks to the bottom when filled with water and, as the latter is released, emits it from a gun.

Tennis and play balls in a wide variety of patterns, including the Neonball, patriotic arrays, and faces, comprised the layout of Pennsylvania Rubber Co., Inc., Jeannette, Pa.

The Seamless Rubber Co., New Haven, Conn., featured druggists' sundries as well as playthings. The latter included a new lighter weight handball, beach balls and tubes, play balls, and rubber horseshoes. Sheerine rainwear and bathing caps appeared in several new styles. Besides there were combs; Slim-ette and Briefs, panty-girdles; rubber gloves: the Patrician with net lining, the Duro, extra-heavy latex in two tones, and the smooth latex Columbia; the Colpac ice cap of latex in which the tabs are in one piece as part of the bag that sports a bakelite stopper; and the combination hot water bottle and ice bag.

Seiberling Latex Products Co., Akron, along with its popular Disney characters presented two new animals, a kitten and a boxing teddy; sponge balls; miniature cars; and play balls, such as the new Sculptured Kitty-Kat face, the educational to teach numbers and letters, and the poinsettia pattern.

Sun Rubber Co., Barberton, O., exhibited teething rings, toy autos and planes, animals, and doll sets and dolls.

Superior Type Co., 1800 W. Larchmont Ave., Chicago, stressed the importance of rubber in printing. Toy presses in three sizes, complete with rubber type, dies, cement, etc., were offered. Rubber type, sign printing, and stamp sets covered the Animal Kingdom, the Circus, Favorite Funnies, Transportation, and Farm Life, and two new numbers, Defense Pictures and Famous Tales with condensed versions of the story to guide in making impressions. Superior Type, incidentally, does all the printing for its many needs from rubber plates.

Balls comprised the display of C. B. Webb Co., Lebanon, Pa., for basketball, volley ball, football, soccer, water polo, soft ball, playgrounds, general exercise, and playtime for children.

The Oak Rubber Co., Ravenna, O., which makes toys and novelties, especially balloons, had its display at 187 Murray St., Newark, N. J.

Collins & Aikman Corp., 51st St. and Parkside Ave., Philadelphia, Pa., recently announced, effective March 7, a 10% wage increase in all piece-work and hourly wage rates except for learners. The firm, which manufactures upholstery fabrics for automobiles and furniture, has more than 1,600 persons in its employ in Rhode Island, as follows: Bristol, 1,100; the West Barrington plant, 300; the Allendale plant, 200.

Charles T. Wilson Co., Inc., dealer in crude rubber, latex, and foreign produce, 99 Wall St., New York, N. Y., on April 1 moved to larger quarters on the twenty-ninth floor at 120 Wall St.

Givaudan Delawanna, Inc., 330 W. 42nd St., New York, N. Y., had added to its research and production staff Fred G. Eichel, formerly with Old Dutch Mustard Co., Inc.

Elinor E. Bechtel Tew, wife of James D. Tew, former president of The B. F. Goodrich Co., Akron, O., died suddenly in Florida on March 4. She also leaves two sons.

Supply Contracts Awarded

The following were included among recent listings of supply contracts awarded by various departments of the United States Government:

NAVY: *cable,* Anaconda Wire & Cable Co., New York, N. Y., $404,313, Collyer Insulated Wire Co., Pawtucket, R. I., $64,026, Crescent Insulated Wire & Cable Co., Trenton, N. J., $99,148, General Electric Co., Schenectady, N. Y., $299,072, Okonite Co., Passaic, N. J., $34,265, Phelps-Dodge Copper Products Corp., New York, $18,299; *erasers,* R. P. Clarke Co., Washington, D. C., $6,250, Old Dominion Paper Co., Norfolk, Va.; *gloves,* Miller Products Co. New York, $13,408; *hose,* Boston Woven Hose & Rubber Co., Cambridge, Mass., $103,484, Goodall Rubber Co., Philadelphia, Pa., $11,220, United States Rubber Co., New York, $48,158; *mattresses,* Firestone Tire & Rubber Co., Akron, $40,764; *tape, friction,* Firestone, $31,711, Jenkins Bros., Bridgeport, Conn., $10,709; *zinc,* New Jersey Zinc Sales Co., Inc., New York, $19,415.

WAR: cable, American Steel & Wire Co., Cleveland, O., $54,757, Bishop Wire & Cable Corp., New York, $43,650, Crescent, $14,750, Okonite, $102,560; *chemicals,* E. I. du Pont de Nemours & Co., Inc., Wilmington, Del., $97,959; *dies,* United Shoe Machinery Corp., Boston, Mass., $3,958; *grinding wheels,* Bay State Abrasive Products Co., Westboro, Mass., $3,807, Carborundum Co., Niagara Falls, N. Y., $3,011, Norton Co.; Worcester, Mass., $1,266; *litharge and lead,* National Lead Co., New York, $1,090; *mountings,* Lord Mfg. Co., Erie, Pa., $1,277; *overshoes,* Goodyear Footwear Corp., Providence, R. I., $133,500; *powder,* American Cyanamid & Chemical Corp., New York, $2,148, du Pont, $3,750; *pumps,* Baldwin Locomotive Works, Philadelphia, $1,065; *raincoats,* Hodgman Rubber Co., Framingham, Mass., $296, U. S. Rubber, $789,750; *scales,* Exact Weight Scale Co., Columbus, O., $8,873; *steel,* Timken Roller Bearing Co., Canton, O., $12,390; *tape, adhesive,* American White Cross Laboratories, Inc., New Rochelle, N. Y., $1,269, Coated Products, Inc., Bound Brook, N. J. $3,360, Excel Taping Machine Co., Laconia, N. Y., $17,100; *tires,* Firestone, $35,875, Goodyear Tire & Rubber Co., Akron, $6,693, Seiberling Rubber Co., Akron, $21,230; *wheel and brake assemblies,* Goodyear, $462,447; *wheels with rubber tires,* Foster, Miller, & Bierly, Inc., Philadelphia, $1,069.

Continental Carbon Co., 295 Madison Ave., New York, N. Y., is expanding its central research facilities for the fundamental investigation and improvement of carbon black. The work will be conducted at the research laboratory at 6130 W. 51st St., Chicago, Ill., under the guidance of C. R. Johnson, technical director of the company, assisted by Leonard H. Cohan. The laboratory is one of the most modern and well equipped of its kind and for work relating to rubber will have available, besides the conventional equipment, a Goodrich flexometer and a Firestone plastometer. The research chemists have at their disposal the services of experienced rubber technicians to amplify the results of their experiments by actual examination in rubber formulations. Dr. Cohan, who received his bachelor's and doctor's degrees at Johns Hopkins University, where he also taught chemistry, was a research chemist for the Colloid Co., Baltimore, Md., from 1936 to 1940. He belongs to the American Chemical Society, Phi Beta Kappa, Sigma Xi, and Phi Lambda Upsilon.

The United States Government, Washington, D. C., having received an adverse decision in the Second Circuit Court in its effort to collect treble damages of $1,053,474 from 17 tire manufacturers charged with collusive bidding in sales to the government, on March 6 requested the Supreme Court to decide whether the Federal Government could sue as "a person" under the Sherman Anti-Trust Act. The case was taken under advisement.

Buffalo Weaving & Belting Co., Buffalo, N. Y., has hired as chief chemist of its rubber division Philip M. Earhart, who had previously served as a technical rubber chemist at The B. F. Goodrich Co., Akron, Vansul, Inc., Englewood, N. J., and the Inland Mfg. Division of General Motors Corp., Clark, N. J.

American Cyanamid & Chemical Corp., 30 Rockefeller Plaza, New York, N. Y., according to A. J. Campbell, general sales manager, on March 19 made L. M. Rice assistant sales manager of the organic chemicals department.

Jos. Stokes Rubber Co., Trenton, N. J., and **Vulcanized Rubber Co.,** Morrisville, Pa., both report increased production of hard rubber goods.

Anaconda Wire & Cable Co., 25 Broadway, New York, N. Y., is building a steel addition to its plant at Moshassuck and Main Sts., Pawtucket, R. I., to cost $15,000.

Wm. Allison Anderson, president, John A. Roebling's Sons Co., Trenton, N. J., and Mrs. Helen S. Stone, of Boston, Mass., were married February 27 at Palm Beach, Fla.

Glyco Products Co., Inc., recently moved its offices, plant, and laboratories from 148 Lafayette St., New York, N. Y., to 230 King St., Brooklyn, N. Y.

The Barrett Co., 40 Rector St., New York, N. Y., has announced that Howard B. Grossman, previously with Rex Refining Co., has joined the Barrett research and development department at its Frankford plant.

Walter W. Plechner, assistant director of research, Titanium Division, National Lead Co., 111 Broadway, New York, N. Y., is on extended active duty, although still retaining his position with National Lead, as assistant A. C. of S., G-3, First Division, U. S. Army, Fort Hamilton, Brooklyn, N. Y.

Harry W. Roberts, president, Pierce-Roberts Rubber Co., Trenton, N. J., has returned from Ormond Beach, Fla., where he spent some time in golfing with a number of Trenton friends.

National Automotive Fibre Corp., Trenton, N. J., has let a contract for a small addition to be used as a cement house.

The Simplification Committee, organized several years ago by the Tire Division of The Rubber Manufacturers Association, Inc., 444 Madison Ave., New York, N. Y., to handle problems of direct interest to dealer, distributer, and consumer, has led several truck tire manufacturers, representing a considerable portion of total industry output, to abandon wrapping all truck tires. Other companies have ceased wrapping the larger sizes and are extending the practice; while the remaining firms are considering the question. Eliminating the wrapping of truck tires is only one of many steps taken by the Simplification Committee to help the industry minimize wasted effort in meeting the demands of national defense.

North American Aviation, Inc., Inglewood, Calif., in an article, "Aircraft Design Research—A Case Study on Training Planes", appearing in the February 1, 1941, issue of *Product Engineering,* reveals that of each dollar spent for materials in an Army training plane of simple type, plastics and rubber, each comprise 3% and wire and cable 5%.

Porosity Testing Machine

(*Continued from page 57*)

given conditions. The unit is housed in a case approximately nine-inch cube, with a six-inch square opening in the bottom which is placed on top of the material to be tested. A small centrifugal blower driven by a 1/40 h.p. motor, which operates at 3,400 r.p.m., draws air through the opening in the bottom and exhausts through a screened opening in the front of the case. A dry-type draft gage measures the rate of air flow and operates the dial indicator. Thus the relative rate of flow or porosity for different materials or different types of the same material is indicated directly on the dial. The instrument was developed in the laboratories of The B. F. Goodrich Co., Akron, O.

OHIO

Goodyear Expanding

Goodyear Aircraft Corp., subsidiary of the Goodyear Tire & Rubber Co., Akron, is purchasing 147 acres of city property south of the Akron Air Dock to construct a plant of 400,000 square feet to expand production of parts for fighting airplanes, in keeping with the national defense program. It will be mid-summer before the plant can be built and equipped, and it is expected that in consequence about 5,000 jobs will be created.

Goodyear last month built Tire No. 325,000,000, which was a 55x19.00-23 airplane Airwheel pneumatic of the type used by Boeing Flying Fortress planes as landing wheel equipment. In August, 1939, Goodyear produced the 300,000,000th tire, first of the snow cruiser tires for the U. S. Antarctic Expedition. On May 7, 1936, Tire No. 250,000,000 was made, a Double Eagle Airwheel for automobile use.

The display of defense products made by Goodyear, along with the motion picture, "Goodyear Shoulders Arms", which has been exhibited throughout the nation, recently returned to Akron for a week's inspection, open to the press, city executives, Goodyear dealers, service clubs, and other local organizations.

Goodyear recently awarded 25-year service pins to 23 more employes, including Elmer G. Kimmich, now engaged in mechanical goods research; Norris E. Kimball, also in the development field; and D. E. Sheahan, general superintendent at the Jackson plant.

Training Airship Pilots

With large increase in naval airships authorized by Congress, Goodyear is using its blimp fleet, hangars, and other facilities at Akron and at its Los Angeles, Calif., air base to train airship pilots. The training classes, started last fall, include 18 students who will complete their course this summer and be qualified to seek commissions in the United States Naval Reserve.

Training program is being conducted in two schools—ground and flight. Ground school classes are held three nights a week at Akron University. Flight training is from the Goodyear airship bases at Wingfoot Lake and at Los Angeles. Ground school course consists of 150 hours of the following: aerostat history; civil air regulations; aerostatics; aerodynamics; balloon and airship design, construction, gases, operation, and maintenance; aerology; engines, theoretical and practical; navigation; radio; instruments; and parachutes. Flight training comprises 200 flight hours of dual instruction and solo time and a series of seven free balloon flights of at least one hour duration each and for an accumulated flying time of 10 hours.

Director of student training is Karl L. Fickes, manager of Goodyear Airship Operations. Ward T. Van Orman, internationally famous free-balloonist and Goodyear employe, is on the ground school faculty.

C. P. Hall Co., Akron, has been appointed exclusive selling agent for Rubber-Glo, the new non-toxic, non-tacky, odorless mold and mandrel lubricant, by its manufacturer, Norris Mfg. Co., Paterson, N. J.

Hydrocarbon Chemical & Rubber Co., Akron, March 10 announced that the synthetic rubber Hycar O.R. is available for general distribution, and orders based on priority are being accepted for April delivery.

Under construction and in preparation for shipment in a Goodyear factory are these rubber track blocks to cushion the treads of U. S. Army caterpillar tanks. Goodyear is making thousands of these blocks under sub-contract for manufacturers of army tanks.

Ninety-Ton Press with Pressing Capacity of 1,350 Tons, Recently Completed by The Adamson Machine Co., Akron, on Order from the British Purchasing Commission for Shipment to London

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The Timken Roller Bearing Co., Canton, recently increased its initial $3,000,000 defense expansion program, inaugurated last year, to $4,000,000, and by mid-1941 expects to appropriate another million. Approximately one-fourth of the current amount has been spent on new building construction, and the remainder for new manufacturing machinery and equipment. New equipment and construction at the steel mill at Canton accounted for $1,500,000; a similar amount went to bearing plants at Columbus, Gambrinus, and Canton; and the balance was expended for miscellaneous equipment and construction at the Mt. Vernon Rock Bit plant, the Wooster tube mill, and the Columbus, Canton, and Gambrinus plants.

The DeVilbiss Co., Toledo, on February 24 held its annual meeting at which the following officers were re-elected: president, Allen D. Gutchess; vice president and general manager, Frank A. Bailey; and secretary-treasurer, Walter W. Conklin. Two new vice presidents also were named, Howard P. DeVilbiss and Roy A. Guyer. The former, son of the late Thomas A. DeVilbiss, who conceived and developed the company's industrial division, has been active in the firm since his father's death in 1928. Mr. Guyer, sales manager of the spray painting division, has been with the company 29 years. Stockholders were informed of increased sales last year and a satisfactory corporate condition.

Firestone Tire & Rubber Co., Akron, for a month recently conducted test runs in southwestern Nevada to prove that present-stock tires can withstand the heat and punishment of continuous driving speeds over 100 miles an hour, should such speeds become commonplace through completion of superhighways.

Seiberling Rubber Co., Akron, through President J. P. Seiberling has announced the election of Col. J. L. Cochrun as a director to succeed Robert Guenther, retired, who however, will continue as the company's general manager. Colonel Cochrun, a retired United States Army officer, served as both Detroit and Akron branch manager for Seiberling, then as assistant sales manager before becoming vice president in charge of sales. He enlisted in the 1st United States Cavalry in 1901, served under General Pershing in the Philippines, and on American entry into the World War, entered service as a colonel, and for a time commanded a regiment on the St. Michel front. Just prior to the close of the war, Colonel Cochrun was assigned to the staff of General Bliss, then organizing the Second Army.

The Seiberling plant in Akron last month was visited by the firm's distributer in Peru, Jose Arbulu, accompanied by his wife, son, and daughter. Officials entertaining the guests were Vice President C. W. Seiberling, Export Manager Harris Waite, Colonel Cochrun, and J. L. Cochrun, Jr.

De Laney Faultless President

The Faultless Rubber Co., Ashland, held a board meeting on February 28 and accepted the resignation of C. D. Hubler, president since 1938, who will, however, remain with the company as executive vice president. His successor is Wallace De Laney. Also, T. W. Miller, with the concern since he helped organize it in 1900, has retired as chairman of the board, but will continue as a director. No new chairman will be named. T. W. Miller, Jr., Faultless vice president since 1937, remains in this capacity. Other members of the board, besides the four officers, are Wm. A. McAfee and J. C. Myers.

The new president, who started his duties April 1, resigned as vice president and factory manager of The Seamless Rubber Co., New Haven, Conn., to assume this post. He had joined the company in 1920 and served successively as supervisor, production manager, factory manager, and vice president. After graduating from public schools in Connecticut, Mr. De Laney worked for The Adams Express Co., The Singer Sewing Machine Co., and R. Wallace & Sons, silverware manufacturer. He entered the rubber business in 1917, when he became associated with the Beacon Falls Rubber Shoe Co., Beacon Falls, Conn. His other more recent business connections, besides the Seamless affiliation, were as vice president of the Absorbent Cotton Co., Valley Park, Mo., and member of the executive committee of the United Cotton Products Co., Fall River, Mass.

Mr. De Laney is a director and a past president of the Manufacturers' Association of New Haven County, director and chairman of the industrial committee of the Y. M. C. A., and a director of the New Haven Community Chest, of the State Industrial Council, and of New Haven's Y. M. C. A. Junior College. His clubs follow: Quinnipiac, Edgewood, and Woodbridge.

Mr. De Laney is married and the father of a daughter and a son.

Wallace De Laney

Airport Runways Use Rubber Joint Sealer

Rai-Seal, a rubber compound to be poured at 400° to 500° F., is being used at the Toledo airport to seal the joints between concrete slabs in the 165,000 square yards of runway. This job will require more than 33,000 pounds of the material which may be exposed to traffic in from 10 to 20 minutes after pouring and can be supplied in concrete color for new installations or in black for resealing. The manufacturer of this material reports that other installations are still in good condition after four-year service tests.

Goodrich Announcements

The B. F. Goodrich Co., Akron, in its annual report to stockholders stated that several thousand of the company's synthetic rubber passenger-car tires, the first ever sold to the American public, are now giving service comparable to that of tires made of natural rubber. The present higher cost of the synthetic, however, precludes its use as a general replacement for natural rubber except if an emergency should arise, but the use of Ameripol is rapidly being expanded in fields of service in which the special characteristics of certain types of the synthetic justify the added cost.

The company concluded, "To create facilities of the capacity required to replace the 600,000 tons of natural rubber the nation uses annually would take a minimum of three years. Even 'stand-by' plants capable of rapid emergency expansion could be built only in from 18 to 24 months."

Tire Replacement Rise Forecast

On March 5, Goodrich held a regional conference of 100 independent jobbers and distributers at the Hotel New Yorker in New York, at which the speakers included Harold Duryea, company district manager, and C. H. Buchanan, sales promotion manager in the Greater New York area. Mr. Duryea predicted for the area a 25% increase over 1940 sales of replacement tires, to reach six-million units, basing his calculations on the record high registration, 2,399,000 cars and trucks, in the metropolitan area and increased purchasing power resulting from the national defense program. He also estimated that 50 corporations in the territory have put synthetic rubber tires on some of their cars and light trucks.

New Koroseal Film

Goodrich has announced the development of a method of processing Koroseal into a transparent and highly durable film with wide industrial application. Glass-clear and highly flexible, the film is being produced in gages ranging from one-thousandth of an inch up and in a variety of colors in transparent, semi-transparent, translucent, and opaque forms.

Dr. H. E. Fritz, sales manager of the synthetics division, has stated that while the chief uses of the film are in waterproofing and packaging materials, the chemical inertness, flame resistance, and electrical properties make it valuable for laminating chemical containers for holding acids and corrosives and for insulating fine electric wire and cable. Other more obvious adaptations are for rainwear garments, shower curtains, window draperies, aprons, and refrigerator bags and food coverings.

Rubber for Resisting Quartz

Goodrich also reports that a large western company operating a stamp mill handling quartz had always believed that one-inch manganese steel plates were the only material that would resist the bullet-like impacts of quartz spattered about in the mill. As an experiment, however, the concern installed Armorite rubber lining ¾-inch thick, consisting of one piece 18 by 90 inches and two pieces 18 by 86 inches. After more than 3,000 tons of the quartz had been crushed on the mill, the company revealed that the rubber lining showed practically no wear and very little "roughing up", although manganese linings under the same conditions would have been worn down from 33⅓ to 50% of their original thickness. Other advantages attributed to the rubber lining by the mining company were its lower cost, quicker installation reducing shutdown time at the mill, and decreased hazards in handling.

Applications for Vibro-Insulators

Goodrich lists the following among new uses for which Vibro-Insulators are applied to reduce vibration: oil burners, air conditioning units, blowers, marine engines, refrigerators, air compressors, vibrating screens, airplane instruments, broaching machines, fans, washing machines, mechanical phonographs, and electromatic typewriters.

NEW ENGLAND

Film on Africa Shown at R. I. Club Meeting

A. P. Williams, of the Colonial Beacon Oil Co., entertained 105 members and guests present at a meeting of the Rhode Island Rubber Club, on March 14, at the Narragansett Hotel, Providence, R. I., with a showing of two reels of the five-reel motion picture which depicted a portion of the 22,000-mile motor trip of the Thaw Asiatic Expedition from Paris to Bombay that led through the Balkan countries and the Continent of Africa.

Dispersions Process, Inc., Naugatuck, Conn., manufacturer of aqueous dispersions of reclaimed, crude, and synthetic rubbers, has elected three new officers and one new director: John P. Coe, vice president; Arthur Surkamp, treasurer and director; and Oscar W. Greiner, assistant secretary. Officers reelected are: F. B. Davis, Jr., chairman; Elmer Roberts, president; Arvid J. Anderson, assistant treasurer; and Eric Burkman, secretary. The new board of directors comprises Messrs. Burkman, Coe, Davis, Roberts, and Surkamp, Morris E. Dry, Paul H. Arthur, Willis A. Gibbons, and Harry E. Humphreys, Jr. Mr. Coe and T. G. Richards continue as general manager and sales manager, respectively.

The Sperry Shoe Co., formerly at 252 Park St., New Haven, Conn., recently moved its offices to 15 Main St., Beacon Falls, Conn., where because of added facilities the company will be able to expand its activities and increase its production. Since its organization four years ago the Sperry Shoe Co. has specialized in the production of rubber and canvas footwear bearing a patented sole specifically designed for yachting service and sold under the name "Top-Sider". This sole has been extended to industrial footwear items and has proved highly satisfactory wherever walking on slippery surfaces is necessary. The Sperry Shoe Co. is considering such other fields as commercial fishing and further inroads into the industrial market.

The Firestone Rubber & Latex Products Co., Fall River, Mass., in its gas mask division now has more than 570 workers, of whom more than 500 are girls. The United States Army, which has placed a substantial order with the company for gas masks, recently installed at the Fall River plant, as testers, inspectors, and supervisors of production, a number of young women, civil service employes of the Federal Government, who have been trained in gas mask work at the Army's arsenal at Edgewood, Md. Production at the Firestone plant is under direct supervision of the Army, which has a federal inspector on hand. The masks are exclusively for the Army; no civilian masks are being made here.

General Latex & Chemical Corp., Cambridge, Mass., has announced that it has added to its research staff Dr. J. Horace Faull, Jr., who for several years was associated with the laboratories of the Firestone Tire & Rubber Co., Akron, O.

The Seamless Rubber Co., New Haven, Conn., through President F. Thatcher Lane has announced the appointment, effective April 1, as vice president and factory manager of Arthur R. Gow to succeed Wallace De Laney, who has resigned to become president of The Faultless Rubber Co., Ashland, O. Mr. Gow joined Seamless in January, 1929, and served as production manager for the past eleven years. Previously for a year after his graduation from college Mr. Gow was associated with the Hood Rubber Co., Watertown, Mass.

Lester E. Packard, secretary of the Avon Sole Co., Avon, Mass., recently addressed the Randolph-Holbrook Rotary Club, Randolph, Mass., on "Rubber Production and the Manufacture of Rubber Goods." He had photographs and other illustrations to enhance his talk and also brought along samples of smoked sheet and crepe soles for inspection.

The New England Butt Co. is erecting an addition to its plant on Pearl St., Providence, R. I., at an estimated cost of $25,700. It will be a one-story brick and steel building, 93 feet 10 inches by 74 feet 6 inches at the foundation, to be attached to an existing building, for use as an assembling room and other manufacturing purposes.

The Bristol Mfg. Co., Bristol, R. I., seeking larger quarters because of increasing business, has asked the Town Council to assist in obtaining a suitable location, otherwise it may move to another town. President Maurice C. Smith, Jr., has stated that his company plans investing some $25,000 in the business and desires a more efficient layout. The firm needs from 75,000 to 100,000 square feet of floor space in contrast to the 40,000 square feet now occupied. About 400 operatives are at present employed, with a weekly payroll of approximately $6,000. When plans are completed, half as many more workers will be used.

Aero-Tread Corp. of New York, Cranston, R. I., through its president, George A. Leavitt, has purchased, at a reported price of $80,000, the plant of the old Imperial Printing & Finishing Co. on Mill St., Cranston, which will be remodeled to suit that buyer's requirements. It is understood Aero-Tread will move its equipment from its Naugatuck, Conn., factory and that when the new plant is in full operation more than 100 persons will be employed. For the past two years the corporation has been experimenting with rubberized cloth and rubber products, including rubberized shoe linings.

MIDWEST

Scrap Rubber Institute Pledges Defense Cooperation

An important meeting of the Scrap Rubber Institute was held at the Hotel Sherman, Chicago, Ill., on March 19 in conjunction with the twenty-eighth annual convention of the National Association of Waste Material Dealers, Inc. At the meeting, Julius Muehlstein, succeeding Nat E. Berzen, was elected president, and A. Schulman, vice-president. W. L. Finger, of the Office of Production Management, spoke informally to members on questions of direct interest to the Institute, and a resolution was passed, pledging cooperation with the government in the carrying out of the defense program. A committee was appointed to cooperate if and when efforts were made by Washington to stabilize scrap rubber prices. So far there has been no necessity for action because prices have remained reasonably low.

Thirty-two rubber companies in the Seventh Federal Reserve District recently reported paying 22,328 employes $578,000 in wages, an increase of 0.2% in workers, but a decline of 4.2% in payments over the previous month.

Monsanto Chemical Co., St. Louis, Mo., according to President Edgar M. Queeny, on March 5 filed a registration statement with the Securities & Exchange Commission, Washington, D. C., preparatory to the issuance of 75,000 shares of $4 cumulative preferred stock, to be known as Series C, which will bring the total of preferred shares to 175,000, against 1,241,694 shares of common outstanding. The shares were offered last month, and the underwriters were headed by Smith, Barney & Co. Proceeds from the new issue will be added to the cash funds of the company, which may be used in the expansion or improvement of present manufacturing facilities or for the establishment of facilities for making new products developed by Monsanto's research laboratories or for improved products. During the past four years the Monsanto Chemical Co. and its domestic subsidiaries spent about $21,000,000 for such purposes.

Wishnick-Tumpeer, Inc., 295 Madison Ave., New York, N. Y., because of substantially increased demand, recently doubled the production potential by the installation of additional still capacity at its Chicago, Ill., refinery, which has been in operation only a few months and is devoted to "Pioneer" brand asphalt products. Storage capacity was tripled, and a second drum-filling unit increased facilities 50%. The asphalt plant at Lawrenceville, Ill., with additional still capacity will increase output about 70%, and new tankage will double its storage capacity.

OBITUARY

Paul O. Gunkel

FOLLOWING several years of ill health, Paul Otto Gunkel, assistant to the president of the Jos. Stokes Rubber Co., Trenton, N. J., died in a New York hospital on March 14. He had been with the company for many years and from 1920 to 1939 had been vice president and general manager of its plant at Welland, Ont., Canada, but after a serious illness had returned to the main office to assume less strenuous duties.

He was born in Akron, O., 47 years ago.

Mr. Gunkel belonged to the Board of Trade, Masons, and Rotary Club, all of Welland, and the Trenton Chamber of Commerce, the Scottish Rite Lodge and Crescent Temple.

Survivors include his parents, his wife, a son, a daughter, two brothers, and two sisters.

Funeral services were held on March 17. Burial was in Trenton.

George H. Carnahan

PNEUMONIA caused the death on March 20 in El Paso, Tex., of George Holmes Carnahan, since 1915 president and chairman of the board of Intercontinental Rubber Co., 745 Fifth Ave., New York, N. Y., and of its many subsidiaries, including Continental Rubber Co., of New York, Continental Mexican Rubber Co., Continental Plantation Co., American Rubber Producers, Inc., Cia. Esplotadora de Hule, S. A., Cia. Ganadera y Textil de Cedros, S.A., and Rubber Surfacers, Inc.

The deceased was born in Cadiz, O., March 16, 1879, and supplemented a high school education with special courses in inorganic chemistry, geology, and metallurgy. Between 1896 and 1902 he acquired engineering experience with mining companies in Leadville, Colo., Mexico, and Ecuador to become, in 1903, general superintendent of mines for the Cia. Metalurgica Mexicana. Then in 1910 Mr. Carnahan signed as manager of the Teziutlan Copper Co., Mexico.

Having grown interested in rubber, especially guayule development in Mexico, he abandoned mining to accept the presidency of the Continental Mexican Rubber Co. in 1914 and the next year became affiliated with Intercontinental. In 1918 he was appointed by the United States Alien Property Custodian a vice president and a director of the Bayer Co., Inc., and of other German corporations.

Mr. Carnahan wrote several papers on rubber production and took out many patents relative to guayule, nitrates, and paper manufacture.

His clubs included the Lotos, New York Athletic, Explorers, and La Jalla Golf. He also belonged to the American Geographical Society, Sons of the American Revolution, American Chemical Society, New York Rubber Exchange, and United States Chamber of Commerce.

Blank-Stoller, Inc.

George H. Carnahan

He is survived by his wife, two sons, and a daughter.

Funeral services were held in New York, March 24.

Henderson M. Green

AFTER a long illness Henderson Montgomery Green, a vice president and a director of Raybestos-Manhattan, Inc., Passaic, N. J., since its incorporation September 5, 1929, died at his home in Montclair, N. J., on March 10. The deceased had been a director of The Manhattan Rubber Mfg. Co., Passaic, from December 14, 1914, and a vice president from February 17, 1916, until the merger with Raybestos. He was also a director of The Manhattan Securities Co., which owns Raybestos-Manhattan rubber plantations. Mr. Green, who was born in Hackensack, N. J., 67 years ago, started his successful rubber career on April 1, 1909, as a salesman in the New York office of the Boston Belting Co.

His clubs included the Bankers of America and the Montclair Golf.

Survivors are his wife and a daughter.

H. M. Green

James F. Giles

ON MARCH 13 in Monroe, N. Y., suddenly died James F. Giles, retired vice president of the American Hard Rubber Co., 11 Mercer St., New York, N. Y. Born in Brooklyn, N. Y., 78 years ago, he became an office boy in October, 1879, for the Ironclad Mfg. Co., and after three years joined the Celluloid Novelty Co. as stock and entry clerk, becoming traveling representative in January, 1884.

On January 1, 1892, Mr. Giles transferred to a similar position with the India Rubber Comb Co., featuring combs and druggists' and stationers' sundries. When the firm merged with the Butler Hard Rubber Co. and the Goodrich Hard Rubber Co. in 1898, the deceased became one of the original incorporators of the then-created American Hard Rubber Co. and was named sales manager of its Listed Goods Division, retiring as such at the end of 1919. Mr. Giles was elected a director in 1903 and continued in this capacity until his death. On October 7, 1928, he was made a vice president.

He was a member of the Greenpoint Lodge No. 403 F. & A. M., and the Brooklyn and Wool clubs.

He is survived by two sisters.

Funeral services were held in Brooklyn, March 16.

James D. McCord

JAMES D. McCORD, retired manager of the Portland, Oreg., branch of United States Rubber Co., died at Palm Springs, Calif., March 10. Born in Vincennes, Ind., November 15, 1888, he attended the University of Illinois. He belonged to the Hawthorne Masonic Lodge and Phi Kappa Sigma. Mr. McCord leaves a wife and a daughter. Funeral services were held in Portland, March 14.

J. H. Robertson

JOSEPH H. ROBERTSON, division sales manager for eastern Canada of the Maple Leaf Rubber Co., Ltd., Port Dalhousie, Ont., died March 9 at his residence in Montreal West. Born 52 years ago at Niagara-on-the-Lake, Ont., he joined the company when he was 14. He is survived by his wife, four sons, and two daughters.

Frank Law

FRANK LAW, 69, former president and general manager of the Oak Tire & Rubber Co., Toronto, Ont., Canada, and at one time president of the Palladium Rubber Co., Baltimore, Md., and the General Tire Corp. of Canada, Ltd., Oakville, Ont., died March 3 in a Toronto hospital. Native of Burton-on-Trent, England, he conducted an insurance and stock brokerage business in Montreal for several years and for a time was vice president of the Ontario Equitable Life Assurance Co. At the time of his death he was vice president of Strathy Basin Mines, Ltd.

George T. Jones

GEORGE T. JONES, former executive of the Davis-Jones Wire Co., Phillipsdale, R. I., died recently. Born in Wooster, Mass., 65 years ago, he was superintendent of the Collyer Insulated Wire Co., Pawtucket, R. I., for several years. In 1922 he became one of the organizers of the Davis-Jones company and long served as secretary-treasurer. He was appointed receiver in 1933, the year he retired.

He leaves his wife, two sons, and a grandchild.

CANADA

Hon. C. D. Howe, Minister of Munitions and Supply, Ottawa, Ont., has announced the appointment of R. C. Berkinshaw as director general of the Priorities Branch of the Department of Munitions and Supply. The creation of this branch of the department, according to Mr. Howe, follows increasing demands being made on Canadian economy by the development of the war industries. Mr. Berkinshaw is general manager and treasurer of the Goodyear Tire & Rubber Co. of Canada, Ltd., New Toronto, Ont., and a director of several industrial companies. He was educated in England and at Upper Canada College, University of Toronto, and Osgoode Hall Law School, Toronto, and during the World War served overseas as a major with the Canadian Engineers and was mentioned in dispatches.

The Department last month awarded supply contracts to the following: B. F. Goodrich Co. of Canada, Ltd., Kitchener, Ont., $45,494; Goodyear Tire & Rubber Co. of Canada, Ltd., New Toronto, Ont., $8,630; Dunlop Tire & Rubber Goods Co., Ltd., New Toronto, $6,195; Miner Rubber Co., Ltd., Montreal, P. Q., $17,024; British Rubber Co. of Canada, Ltd., Montreal, $9,840; Kaufman Rubber Co., Ltd., Kitchener, $27,995; and Dominion Rubber Co., Ltd., Montreal, $10,080.

Minister Howe has also announced that capital assistance given by the Dominion Government to Canadian industrial companies from the outbreak of war up to February 22 includes the following rubber concerns: Seiberling Rubber Co. of Canada, Ltd., Toronto, $100,025; Dominion Rubber, $163,469; Dunlop, for tires, $148,500; and, also for tires, Firestone Tire & Rubber Co., Ltd., Hamilton, Ont., $124,900, Goodyear, $592,433.

The Dominion Department of Munitions and Supply has figured that at least 3,000 tires and inner tubes will be required daily for the 600 mechanized units local factories will soon be making. Besides replacements will be needed for the 1,666,883 private motor vehicles of all kinds registered the beginning of 1941. Thus domestic demand, civilian as well as military, in Canada will about eliminate her fairly extensive export trade in tires and tubes.

It is also estimated that about 70 million pounds of crude rubber are on hand, en route, or under contract to tire manufacturers in the Dominion.

Hon. J. G. Gardiner, war service minister, has requested rubber plants throughout Canada to conserve waste rubber in any form for war purposes. Other industries using trucks and cars are being asked to give their old tires as well as other waste materials to the Government.

National Research Council is aiding industry in Canada with technical guidance and cooperative assistance in solving plant, engineering, and processing problems and is also helping the Government in its defense plans. Among its many laboratories, which have been expanded to handle the growing work necessitated by the war, is one devoted to rubber, and recent investigations include the bonding of synthetic rubber and latex to metal and the properties of acetylene black in rubber, whereby it was learned that rubber compounded with this material is electrically conducting and its thermal conductivity is greatly increased.

Canadian Chemistry and Process Industries recently recorded that in 1939 Canadian establishments (54) manufacturing tires, footwear, and other rubber goods, had a production worth $69,945,471. Nearly 82% of the capital employed ($65,374,269) is in Ontario. Materials used cost $28,814,003 in 1939, some of the items being: carbon black, $527,700; clays and earths, $80,745; mica, $9,423; solvents, $199,796; sulphur, $58,977; soapstone, $2,689; whiting, $120,100; zinc oxide, $408,389; talc, $13,121; barytes, $10,483.

W. J. Trotter, of Penticton, B. C., received a letter from his sister in England, describing a wartime use for discarded automobile tires. She tells of having an air raid shelter built of 18 used tires "bolted together like a tunnel," providing her with a shelter in which she could lie full length. Tests proved it would stand four or five tons of debris.

The B. F. Goodrich Rubber Co. of Canada, Ltd., Kitchener, Ont., is erecting an addition to its factory on King St. W., comprising a building 22 by 120 feet, or a total of 2,640 square feet of floor space, at an estimated cost of $10,000, with equipment to cost between $30,000 and $40,000. The new structure is needed to provide additional floor space for the manufacture of tires, especially heavy-duty and airplane.

Ames Holden Tire & Rubber Co., Ltd., Montreal, P. Q., has called $22,300 of its 7% first mortgage bonds for redemption May 1 at $105 and accrued interest. National Trust Co., trustee, has announced the serial numbers of the bonds drawn, which may be submitted to it for payment. The bonds have been assumed by the B. F. Goodrich Co. of Canada, Ltd., Kitchener, Ont.

FINANCIAL

Unless otherwise indicated, the results of operations of the following are after operating expenses, federal income taxes, and other deductions. Additional tax charges under the Revenue Act of 1940 *have been made against earnings in many reports.*

American Cyanamid Co., New York, N. Y., and subsidiaries. For 1940: net income, $6,629,729, equal, after preferred dividend requirements, to $2.44 a common share, against $5,420,748, or $2.07 a share in 1939; current assets, $45,942,362, current liabilities, $12,754,508, against $39,445,230 and $9,040,126, respectively, December 31, 1939.

American Hard Rubber Co., New York, N. Y. For 1940: net profit, after $61,003 loss on sale of securities, $456,457, equal, after preferred dividends, to $4.73 each on 65,503 shares of common stock, against $386,123, or $3.12 a common share, in 1939.

American Wringer Company, Inc., Woonsocket, R. I., and subsidiaries. For 1940: net earnings, $261,225, or $2.34 a share after providing for earnings of minority stockholders of subsidiaries, against $299,481 in 1939. In December the company purchased 1,000 shares of Chamberlain Corp. preferred stock at $27.50 a share, paying $5,000 in cash and the balance in four equal payments, two to be made in 1941 and two in 1942. The company now owns 99½% of this subsidiary.

American Zinc, Lead & Smelting Co., Columbus, O., and subidiaries. For 1940: net profit, $596,305, equal after dividend requirements on $5 prior preferred and $6 preferred stocks, on which are accumulations of back dividends, to 38¢ each on 673,088 common shares, contrasted with $319,632, or $4.70 each on 67,953 shares of $6 preferred stock in 1939. Accumulated unpaid dividends on prior preferred stock at the year-end were $1.25 a share and on the $6 preferred $1.11 a share. December quarter: net profit, $188,801, or 15¢ a share, against September quarter net of $153,864, or 10¢ a common share, and $159,372, or 11¢ a common share, for the final quarter of 1939.

Armstrong Cork Co., Lancaster, Pa., and domestic subsidiaries. For 1940: net income, $4,154,065, equal to $2.79 a common share, against $4,440,194, or $3 a share, in 1939; sales, $57,353,703, against $50,713,436.

Canada Wire & Cable Co., Ltd., Leaside, Ont., Canada. For 1940: net profit, $743,186, after excess profits taxes, equal to $2.91 each on 150,664 shares of Class B common stock after dividend requirements on 6½% cumulative preferred and $4 Class A stocks, against $690,805, or $2.56 a share on Class B common, in 1939.

Columbian Carbon Co., New York, N. Y. For 1940: net income, after all charges including depreciation and depletion at $2,482,111, $3,068,799, including $166,011 profit on the sale of securities, equal to $5.71 each on 537,406 capital shares, contrasted with $2,857,103 in 1939, when profit on securities was $21,043 and depreciation and depletion, $2,231,319; sales, $16,140,526, against $15,158,759; current assets, $9,119,889 including $4,581,658 cash, and current liabilities, $1,684,289, compared with the respective figures of $7,823,905, $3,120,440, and $1,630,410 December 31, 1939; taxes were up 24.3%.

Pittsburgh Plate Glass Co., Pittsburgh, Pa. For 1940: net income, $13,793,937, equal to $6.30 each on 2,188,040 capital shares outstanding, against $10,766,412, or $4.94 a share, in 1939; expenditures for expansions and improvements, $8,186,656, against $4,333,697; current assets, $57,384,056, against $55,465,871; cash and marketable securities, $26,155,057, against $24,471,546; current liabilities, $8,392,232, against $11,941,844; inventories, $20,385,039, against $21,539,920.

Monsanto Chemical Co., St. Louis, Mo., and domestic subsidiaries. For 1940: net income, $5,519,289, or $4.04 each on 1,241,694 common shares, against $5,226,891, or $3.81 a share, in 1939; net sales, $45,607,600, an all-time high, against $38,513,834; current assets, $20,396,118, against $17,985,743; current liabilities, $7,757,470, against $5,187,986.

Mt. Vernon-Woodberry Mills, Inc., Baltimore, Md. For 1940: net profit, after contingent reserve, reserve for inventory, and other charges, $787,807, equal after preferred dividend requirements, to $8.71 each on 45,119 common shares, against $335,998, or $5.84 each in 1939.

National Lead Co., New York, N. Y., and wholly owned domestic subsidiaries. For 1940: net profit, after all charges, $6,102,702, equal, after preferred dividend requirements, to $1.34 each on 3,095,100 common shares excluding 3,210 shares company held, contrasted with $5,780,500, or $1.23 a share, in 1939; sales, $90,696,461, against $80,906,328; current assets, December 31, 1940, $44,459,070, current liabilities, $6,836,080, against $42,132,588 and $5,503,002, respectively, at the previous year end.

FROM OUR COLUMNS

50 Years Ago—April, 1891

Not only has the advantage of rubber placed under machinery to prevent jarring and vibration been generally recognized, but it has been advantageously employed as a cushion for the axles of vehicles. (p. 187)

In 1850, E. S. Converse came to Malden, and in 1853 established the Boston Rubber Shoe Co. His factories today are the largest rubber manufactories in the world. (p. 188)

The materials used in the French method of preparing artificial grindstones, which was inaugurated more than 25 years ago, are pulverized quartz, powdered flint, powdered emery or corundum, and India rubber dissolved in some suitable solvent. (p. 191)

If a strip of gum rubber be heated, then expanded and quickly wound upon a metal tube, and then cooled in a cooling mixture, it immediately loses all of its elasticity and has no tendency to contract. If, however, it is then put into hot water, it at once regains its elasticity and returns to its original length. These are what may be called the secondary effects of elasticity. (p. 199)

Derry's Water-proof Harness Oil, which was said to be made from ivory black, seal oil, tallow, and India rubber, was used on carriage tops, on boots and shoes, and was said to be a great leather preserver. (p. 203)

25 Years Ago—April, 1916

The rubber products reported by the Bureau of Census for 331 establishments for 1914 were valued at $300,251,827. At the census of 1909, 267 establishments were reported, with products valued at $197,394,638. The value of tires produced in 1914 was $146,411,692; rubber footwear, $50,506,156; and belting and hose, $28,340,749. (p. 335)

The work of Spence and Kratz appears to demonstrate that insoluble nitrogenous residue found in rubber is not pure protein, but a complex of protein and carbohydrate, probably a glucoprotein. (p. 344)

David A. Cutler has purchased the business, factory, and real estate of the Alfred Hale Rubber Co., in South Boston. (p. 372)

It has been found that the cost of tapping decreases as the yield of rubber increases and the following figures give the costs in Ceylon for several years: 200 pounds per acre, 20¢ per pound; 300 pounds per acre, 17¢ per pound; 400 pounds per acre, 13 to 14¢ per pound; and over 400 pounds per acre, 10 to 13¢ per pound. (p. 380)

In 1905, 1,977 pounds of rubber were exported from British Malaya; in 1910, 14,368,863 pounds; and in 1915, 99,733,760 pounds. (p. 381)

Dividends Declared

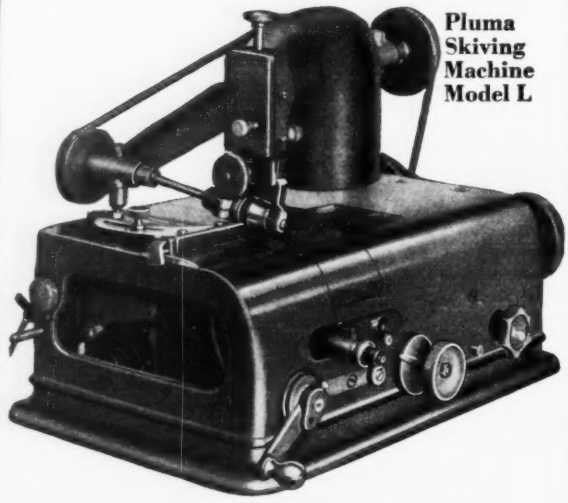
Company	Stock	Rate	Payable	Stock of Record
American Hard Rubber Co.	Pfd.	$2.00 q.	Mar. 31	Mar. 20
Baldwin Rubber Co.	Com.	$0.125	Apr. 21	Apr. 15
Baldwin Rubber Co.	Com.	$0.125 extra	Apr. 21	Apr. 15
Canadian Westinghouse Co., Ltd.	Com.	$0.50 q.	Apr. 1	Mar. 17
Collyer Insulated Wire Co.	Com.	$0.30 irreg.	Apr. 1	Mar. 24
Crown Cork International Corp.	"A" Pfd.	$0.10	Apr. 1	Mar. 20
Detroit Gasket & Mfg. Co.	Com.	$0.25	Apr. 21	Apr. 5
E. I. du Pont de Nemours & Co., Inc.	Pfd.	$1.125	Apr. 25	Apr. 10
E. I. du Pont de Nemours & Co., Inc.	Com.	$1.75 interim	Mar. 14	Feb. 24
Endicott Johnson Corp.	Com.	$0.75	Apr. 1	Mar. 27
Endicott Johnson Corp.	Pfd.	$1.25 q.	Apr. 1	Mar. 27
Firestone Tire & Rubber Co.	Com.	$0.25	Apr. 21	Apr. 5
Fisk Rubber Co.	Com.	$0.60 liquidating	Mar. 20, 1941	Apr. 1, 1940.
Garlock Packing Co.	Com.	$0.75 irreg.	Mar. 31	Mar. 22
General Electric Co.	Com.	$0.35 q.	Apr. 25	Mar. 14
General Tire & Rubber Co.	Pfd.	$1.50 q.	Mar. 31	Mar. 21
Jenkins Bros.	Founders Shares	$1.00 irreg.	Mar. 28	Mar. 14
Jenkins Bros.	Non-voting	$1.00 irreg.	Mar. 28	Mar. 14
Jenkins Bros.	7% Pfd.	$1.75 q.	Mar. 20	Mar. 14
I. B. Kleinert Rubber Co.	Com.	$0.20 irreg.	Mar. 31	Mar. 15
Mansfield Tire & Rubber Co.	Com.	$0.10	Mar. 20	Mar. 10
Mansfield Tire & Rubber Co.	$1.20 Cv. Pfd.	$0.30 q.	Apr. 1	Mar. 15
Rome Cable Corp.	Com.	$0.15 q.	Mar. 29	Mar. 13
Seiberling Rubber Co.	5% Pfd. "A"	$1.25 q.	Apr. 1	Mar. 20
Seiberling Rubber Co.	$2.50 Pt. Pfd.	$0.63 q.	Apr. 1	Mar. 2
United States Rubber Co.	Com.	$0.50	Apr. 30	Apr. 16
United States Rubber Co.	8% Non-Cv. 1st Pfd.	2%	Mar. 28	Mar. 21
Washburn Wire Co.	Com.	$0.50	Mar. 15	Mar. 5

National Rubber Machinery Co., Akron, O., and subsidiary. For 1940: loss after all taxes and charges, $52,115, against profit of $102,331, or 66¢ a share, in 1939.

Skelly Oil Co., Kansas City, Mo. For 1940: consolidated net income, after all charges and taxes, $3,316,678, equal, after preferred dividend requirements, to $3.28 each on 981,349 common shares outstanding, against $2,360,783, or $1.98 a common share, in 1939, gross operating income $34,570,748, against $33,107,181; current assets, $12,532,713, current liabilities, $4,838,671, against the respective figures of $11,731,242 and $3,942,449 on December 31, 1939.

Western Electric Co., Inc., New York, N. Y. For 1940: net income, after all expenses and charges, $32,787,030, equal to $5.46 a capital share, against $16,476,086, or $2.75 a share, in 1939; net working capital, $74,150,000, against $73,107,000; sales, $241,618,000, a 29.3% gain over 1939; taxes, $14,840,000, against $8,438,000 in 1939.

S. S. White Dental Mfg. Co., Philadelphia, Pa., and subsidiaries. For 1940: net profit after write-off of investment in French subsidiary, $340,583, equal to $1.15 each on 294,120 capital shares, against $257,687, or 87¢ each, in 1939.



Pluma Skiving Machine Model L

FOR SKIVING FABRIC OR CORD TIRE PATCHES AND RELINERS

THE Pluma Skiving Machine — Model L is particularly adapted for skiving belting, rubber mats, etc., and all kinds of material used in the manufacture and reclaiming of Auto Tires.

In Rubber Shoe Factories it is used to advantage in skiving counters, also rubber soles and heels where a rolled edge is desired.

This machine is equipped with a steel feed roll especially suited for this class of work, also with a power top presser roll having a double end bearing. It has an improved gear driven grinder, which eliminates belt troubles, where water is used on the knife head parts. These features, together with a knife six inches in diameter, enable the operator to skive a uniform wide bevel scarf. It can also be fitted for a narrow scarf if desired. A water device for wetting the knife when used for skiving rubber is also provided.

UNITED SHOE MACHINERY CORP.
BOSTON, MASS.

BRANCHES:

Atlanta, Georgia	29½ Pryor Street, N. E.
Auburn, Maine	38 Minot Avenue
Brockton, Mass.	93 Centre Street
Chicago, Illinois	500 So. Franklin Street
Cincinnati, Ohio	407 East 8th Street
Haverhill, Mass.	145 Essex Street
Johnson City, New York	19 Jennison Avenue
Lynn, Mass.	525 Union Street
Milwaukee, Wisconsin	922 No. Fourth Street
New York, New York	110 Fifth Avenue
Philadelphia, Penna.	221 No. 13th Street
Rochester, New York	60 Commercial Street
St. Louis, Missouri	2200 Washington Avenue
San Francisco, Calif.	859 Mission Street
Worcester, Mass.	71 Mechanic Street

EUROPE

GREAT BRITAIN

Rubber Goods for Air-Raid Protection

The part that rubber is playing in alleviating some conditions resulting from air raids is described by the British Rubber Publicity Association in a recent issue of *The Bulletin of the Rubber Growers' Association*. Among the devices made to protect the ears and head against concussions are latex sponge bandeaus covered with a stockinette material available in several colors; latex sponge ear-caps which soften loud noises without preventing the wearer from hearing conversation or sirens; soft flexible rubber ear-plugs, easy to apply and comfortable to wear; ear-protectors consisting of disks of sponge rubber with cork backing, which can be worn over the respirator; various types of mouth-protectors, or gags as they are called, ranging from strips of ordinary sole crepe to specially molded styles; biting these gags, it is claimed protects the ear-drums against concussion. Then there are rubber spectacle frames, designed by an eye specialist; the rims will hold any type of lens, and sponge rubber pads keep them away from the eyelashes.

Strong rubber cases for carrying electric torches and their batteries, and a hand-lamp with molded rubber body and special flexible rubber hood, painted white on the under side, are intended for A.R.P. workers. The Toucan lamp, as it is called, has a built-in accumulator which requires recharging not more than about twice a year.

Workers engaged in decontaminating articles that have been in contact with poison gases, need at least rubber gloves, respirators, rubber boots, and large rubber or oilskin aprons for adequate protection. For these workers a new fabric-lined latex gauntlet has been produced, the shape and flexibility of which permit free use of the hands; while the lining insures easy and quick removal of the gloves when necessary. Special rubber ear-caps to be worn over respirators have also been devised to protect the ears against poison gases.

Finally, are identification labels of molded rubber obtainable in various colors. These have spaces for name, address, identity card numbers, etc.

Shot Molding

Molding with hot steel shot without the use of any special molds, is a new process discussed in a recent issue of the *Electrical Times*. The heated shot, which has a diameter of 40/1000-inch, acts as fluid and provides both the heat and the even pressure required for forming and curing around a matrix or in a shape which it is desired to reproduce. As an example of the procedure appears a description of the pressing and curing of a field coil encased with fabric treated with synthetic resin. The whole is first covered with some kind of protective sheet, as rubber, to prevent the small shot from adhering to the hot resin, and is then placed into a metal molding box, the space between the article and the sides of the box being filled with hot steel shot. Pressure is then applied by means of a plunger in the top of the box and actuated by external hydraulic pressure. The appropriate temperature and pressure are maintained for about half-an-hour, when the operation is completed, and the object can be removed from the box and the rubber cover taken off.

The process seems most suitable for covering shaped objects and for producing tapered tubes which cannot be made by the usual machine-rolling method. It also offers the possibility of pressing protective coverings on to air-screws, and should, furthermore, be useful in making certain hollow goods. Up to the present it has been used for producing various plastic-bonded articles.

It is pointed out that the use of what may be called a fluid plunger permits undercuts inside boxes to be made with ease, thus obviating the difficulty of removing internal mold parts.

Notes

Technical men of the rubber industry who have joined the Forces, but desire to continue their technical education by means of correspondence courses, have been invited to communicate with the Secretary of the Institution of the Rubber Industry.

The Northern Polytechnic announces that it is unable to hold normal evening classes, but has arranged to give prospective students who so wish, instruction in rubber technology and plastics on Saturday afternoons and on Sundays.

Crude rubber imports into the United Kingdom during 1940 were valued at £23,735,185, against £9,463,717 in 1939. Exports of British rubber manufactures were valued at £1,885,883, against £1,450,721 in 1939. Heavy shipments in the first half of 1940 accounted for the increase; in the latter part of the year exports dropped sharply; for instance, December exports were valued at only £76,471, against £181,012 in the same month of 1939.

GERMANY

Substitutes for Hard Rubber

Buna S has for some years now also been used as a hard rubber for lining pipes and apparatus, especially in the chemical industry. While the mechanical and electrical properties of buna do not differ very much from those of natural rubber, difficulties have arisen in connection with its plasticity and in processing it. At first natural rubber solutions were used for cementing hard buna linings, but as this proved unsatisfactory, buna solutions, which seem adequate, have been developed. The chemical resistance of hard buna linings is like that of natural hard rubber, but their resistance to various swelling agents, as benzol and toluol, and to high temperatures is superior. In connection with the latter property, it was shown that buna-lined steam injection pipes stood up well under temperatures up to 160°, with frequent abrupt changes in temperature.

In addition to its use for linings, hard buna is also employed in the form of molded parts, as nozzles, filters, rods, etc. The artificial silk industry in particular is said to utilize large amounts of these parts.

Various thermoplasts, as polystyrol, Igelit MP and Igelit PCU, the Lupamids, etc., are also being utilized in place of hard rubber. The Lupamids are comparatively new products about which very little has as yet been published. They come in varying degrees of hardness ranging from leather-like qualities to those resembling horn. What seems to make them particularly promising is that they combine a high resistance to those solvents that affect natural rubber most—as aromatic and chlorinated hydrocarbons—with a strength hitherto not found in any organic working material.

Lupamid A, an opaque, white material, has a specific gravity of 1.13; its Martens number is 60-65, and depending on the degree of orientation and the form of the test piece, the tensile strength (kg/cm²) ranges from 500 to 5,000. Bending strength (kg/cm²) is 1,000, and impact bending strength (cmkg/cm²) over 150. It resists the usual rubber solvents, as already mentioned, but cannot withstand sulphuric, nitric, and chromic acid. Various experiments exploiting the exceptional properties of the Lupamids are in progress.

Foreign Trade at Pre-War Level

In a recent address on the present condition of German foreign trade, Dr. Rudolf Eicke, a director of the Reichsbank, announced that the temporary reduction in the volume of this trade that resulted after the outbreak of the war had gradually been made up. Although various overseas markets cannot now be reached, he said, business with the European countries and parts of the Near East has become so active that the volume of both imports and exports is now again at pre-war level. Imports, of course, are predominantly raw materials and foodstuffs, of which greatly increased quantities have come from Southeastern Europe, particularly Rumania,

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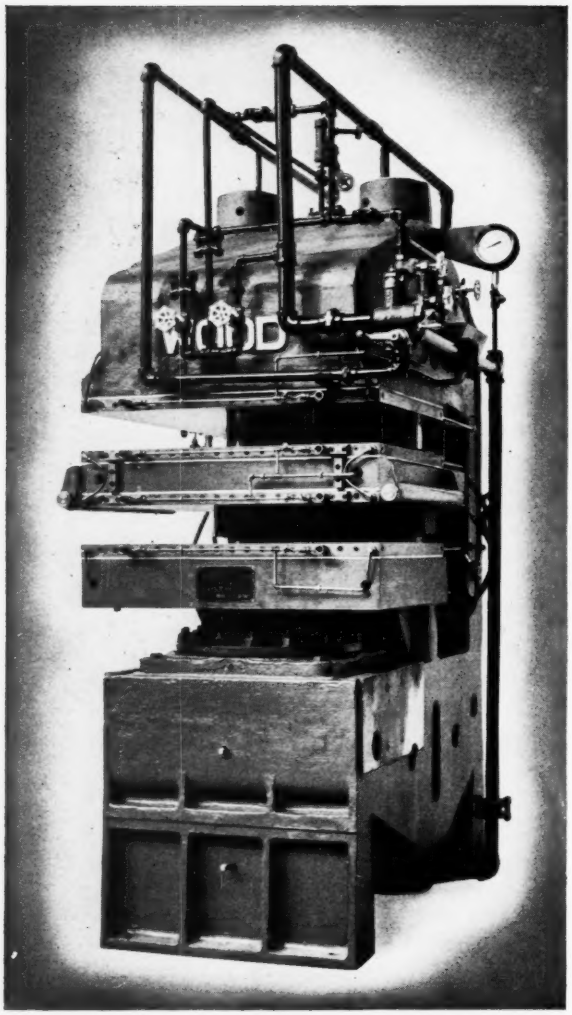

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as well as from Russia, Italy, Scandinavia, Holland, France, and Belgium. In return, there is a lively demand from these countries for German manufactures.

Practically all Germany's foreign business is transacted in Reichsmarks; so there are now no worries about foreign currency to pay for imports. At the same time the unfavorable difference which existed for the mark in countries of Southeastern Europe has been substantially reduced through the influence of Germany, and it is expected that it will be eliminated altogether before long.

SWITZERLAND

A method of making molds from sprayed metal for use in various industries, particularly rubber, has been patented by M. U. Schoop, of Zurich, Switzerland.[1] Originally the process involved oxy-acetylene melting of the metal, but this is now carried out electrically (50 volts and 200 amperes, D.C. or A.C.). An electric spray gun is used and the basis of the process is that two electrodes under tension are shifted forward at an adjustable rate so that an arc is formed at the ends of the poles. Drops of melted metal are produced continuously, which are atomized by means of a current of compressed air. Any object within range of the spray of "metal mist" is metallized, or coated with a layer of metal, the thickness of which is directly proportional to the duration of the spraying period.

In this way molds and matrices of any shape and size can quickly be made from any hard metal (Siemens-Martin steel, chromium nickel steel, Krupp steel, etc.). The grain of the material is exceptionally fine, but it can be ground, polished, planed, or tempered, as desired.

To make a mold for some rubber article from Siemens-Martin steel, for instance, a stream of the atomized metal is directed on to the master pattern (made of beech wood, rubber, plaster of Paris, etc.) from a distance of about 25 centimeters until a metal layer of 20 to 25 millimeters thick is formed. All the contours of the model are so exactly reproduced that no final chasing is required. The present experimental set-up sprays about 10 kilograms of Siemens-Martin steel in an hour, but this output can easily be multiplied by increasing the electrodes. It is added that the process of atomizing and spraying involves a considerable increase in hardness (up to 30%), also that there is practically no contraction.

[1] *Gummi-Ztg.*, Dec. 20, 1940, p. 942.

EUROPEAN NOTES

Advices from Bulgaria before the German occupation stated that certain laws had been modified to permit the manufacture of synthetic rubbers, which was planned at the time. Nothing further is known about the scheme.

A recent order requires the registering of all pneumatic tires and tubes for motor vehicles and motor cycles, except those belonging to diplomats' cars, foreign registry cars, and cars temporarily in circulation in the country. These goods may not be transferred, and the government may requisition them for military or civilian use.

In order to be self-sufficient in respect of crude rubber, synthetic rubber production has been studied in Italy, and also the production of guayule and *Hevea*. Guayule has been grown experimentally in Southern Italy, Sicily, and Libya, and *Hevea* in Ethiopia. However, in view of the progress of the war in Africa, it is questionable whether Italy will be able to pursue the work in that continent, if she has not already had to give it up for the most part.

The editors and publisher of the *Indische Mercuur*, which for 63 years had appeared every week in Amsterdam, Holland,

giving news about the trade, agriculture, industry, and mining of the Netherlands East and West Indies, announce that they have decided to suspend publication of the paper for the present. They feel that in view of the fact that communications have been severed with the Netherlands possessions and that the paper can thus no longer serve readers and advertisers properly, the good reputation of the paper would only be jeopardized by its continued appearance under existing circumstances.

FAR EAST

NETHERLAND INDIA

Determining the KOH Number of Latex

Working on the problem of determining the KOH number for testing latex, H. F. Jordan applied titration of latex with fixed alkali. The amount of KOH that must be added to latex to reach the end of the titration, based on 100 grams total solids in the latex, indicated the KOH number. Mr. Jordan further found that the KOH number was most easily determined if the liquid contained about 0.2% ammonia, since then the inflection of the titration curve is most pronounced. As the percentage of ammonia in preserved latex is always over 0.2%, this had to be reduced by adding formaldehyde. The KOH number was said not to be influenced by this addition.

However O. B. Schrieke[1] found that though he could confirm Jordan's finding that the KOH number of normal latex is not influenced by adding increased amounts of ammonia, this was not true of preserved latex, the ammonia content of which had been reduced by the addition of formaldehyde. In this case the KOH number decreased when more formaldehyde was added; the decrease in some cases amounted to more than 10% of the original value.

This finding led to the assumption that formaldehyde reacts not only with ammonia, but also with some other component which may affect the potential acidity of the latex. Since it is known that latex components containing amino-groups influence its titration, tests were conducted with the simplest member of this group, glycocoll. Results led to the conclusion that the simultaneous presence in latex of ammonia and formaldehyde renders compounds containing an amino-group (amino acids, polypeptides, and proteins) ineffective. This produces titration results which are too low and reduces the KOH number.

No quantitative relation between KOH numbers determined in the presence of varying concentrations of formaldehyde and ammonia has been established. It is, therefore, preferable not to reduce the ammonia content by the addition of formaldehyde, even though the inflection point is less distinct in latex with high ammonia content.

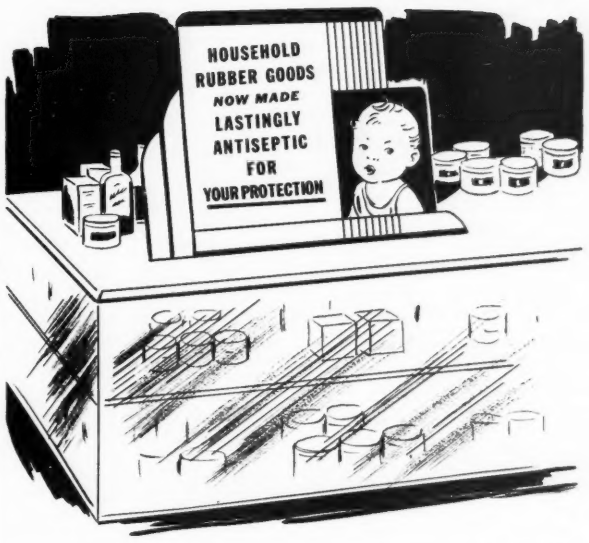
[1] "The Reaction between Ammonia Formaldehyde, and Amino Acids and Its Influence on the Determination of the KOH Number of Latex." *Arch. Rubbercultuur*, 24, 7, 550-49 (1940).

Crude Rubber Exports

The unusually large shipments of last October, 50,000 tons, were not repeated in the last two months of 1940; the totals were 37,547 tons in November and 34,688 tons in December. Exports for the year totaled 531,173 tons, against an exportable allowance of 536,000 tons. The shares of estate and native rubber in the exports of November and December, follow:

	Tons		
1940	Estate Rubber	Native Rubber	Total
November	17,593	19,954	37,547
December	25,358	9,330	34,688

Tire imports have been reported sharply curtailed, but local production shows a corresponding increase.



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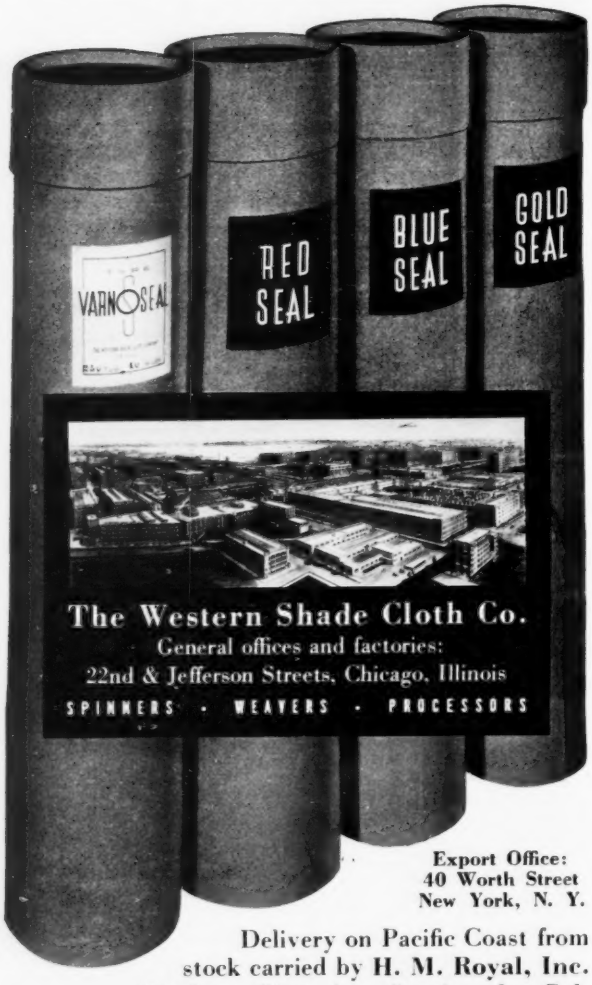


Export Office:
40 Worth Street
New York, N. Y.

Delivery on Pacific Coast from stock carried by H. M. Royal, Inc. 4814 Loma Vista Ave., Los Angeles, Cal.

MALAYA

On How to Meet the Threat of Synthetics

There has been much discussion in British rubber circles of how to meet the threat of synthetic rubber, and Dr. H. P. Stevens, rubber chemist, has corresponded with the Rubber Research Institute of Malaya about the subject.

Some time ago he wrote an article for the *Bulletin of the Rubber Growers' Association* on "Synthetic and Substitutes" during which he criticized rubber estate methods, stating that not a single radical change had been made in factory procedure (latex excepted) in the last 30 years. The whole operation in many respects resembled the medieval process of papermaking, he said, adding that it should not be necessary to wait hours for latex to coagulate and days for the coagulum to dry. If the coagulum were sufficiently thin, coagulation and drying could be effected rapidly enough for a continuous process, which would make production cheaper.

The Rubber Research Institute, in replying to this article, stated that no radical change has been made, because no better general principle has been evolved; that manufacturing costs on estates are now so low that if they could be entirely eliminated, the net result would be negligible as far as affecting the competitive power with synthetics was concerned; that manufacturing was already to some extent continuous on modern estates, but since latex does not come in from the fields continuously day and night, a continuous process such as Dr. Stevens advocates offers no special advantage.

This reply did not satisfy Dr. Stevens, who wrote again pointing out that a continuous process has the advantage of giving a more uniform output and makes the use of smaller and cheaper factories possible. As to the present manufacturing costs on the plantation, these were low because labor was still cheap, but labor was becoming dearer, and in future these costs would bulk much larger. He wound up by suggesting that the real obstacle to progress here was the temperamental resistance to new ideas and new methods in established industries.

In the December, 1940, issue of the *R.R.I. Planters Bulletin*, the Institute undertook to settle the matter once and for all. It showed, first, that considerable progress has occurred in the mechanization of factory procedure on estates in the last 20 years so that today ten men can turn out an amount of work that formerly required 60 men, and, second, that the present costs of factory labor and supervision, at around 0.2-cent per pound, constitute a very small part of the total cost of producing rubber so that factory labor costs could be doubled and still represent less than 5% of the average total production costs. As the Institute had pointed out earlier, the average f.o.b. cost of rubber for a number of estates with combined area of 100,000 acres, is 14.80 cents per pound, which includes such direct costs as planting, tapping, manufacturing, packing, freight to the shipping port, insurance, etc., tapping costs alone averaging 3⅓ cents per pound.

Dr. Stevens' argument in favor of a continuous process are further countered by the explanation that it would not give more uniform product, as Dr. Stevens contends, because latex varies from day to day from natural causes, and the product will vary similarly, irrespective of the manufacturing process, unless some method of bulking latex over a long period were evolved, and this would not reduce costs. Again, while latex can be coagulated in a very short time, the usual practice of overnight coagulation is necessary to keep the quantity of acid low and to produce a coagulum with a texture that will insure low power consumption for machinery. Rapid drying of sheet is also possible by increasing the drying temperature, but the product would be blistered and bubbly and classed inferior.

Details are given of tests made some years ago at the R.R.I. Experiment Station to reduce the drying period of rubber by using a thermostatically controlled drying house. It was thus indeed possible to reduce the size of the building by half and to dry sheet in 48 hours instead of the normal three or four days. But instead of wood fuel and manual firing, the more costly oil fuel had to be used, and an engine installed to drive the air compressor and fans; while a skilled mechanic instead of the ordinary laborer was needed to supervise operations so that costs for drying alone came to 0.4-cent per pound, against usual total manufacturing costs of around

0.5-cent on modern estates. Moreover the sheet was only dried and not smoked and was held inferior to smoked sheet.

The conclusion arrived at after due consideration of all points is that the reduction of estate manufacturing costs plays no very useful part in fighting the threat of synthetic rubber and that the more effective method is to increase output by the development of high-yielding planting material.

Imports of Rubber Cases Restricted

A F. M. S. Notification, No. 5,222, of October 1, 1940, adds the following to the schedule to the Importation of Goods (Absolute Prohibition) (No. 2) Order, 1939: rubber cases complete made of three-ply wood; parts of rubber cases of three-ply wood, viz., sides, tops, bottoms, or battens; fittings for rubber cases of three-ply wood. Goods included in the Absolute Prohibition Order are positively prohibited to be imported into the Federated Malay States otherwise than from any part of the British Empire, the currency of which is on a sterling basis, or Egypt, the Anglo-Egyptian Sudan, or Iraq.

Notes

An additional export duty of 2½%, effective January 20, was imposed on all rubber produced in and exported from the Straits Settlements, which thus doubles the export duty on rubber. It was further announced that rubber growers paying this tax may claim exemption from the income tax which a proposed War Tax Bill will levy if it is passed. It was proposed to subject rubber exports from the F. M. S. to a similar increase in export duty, effective February 1, 1941.

In view of the interest in the question of whether clonal seedlings or bud-grafts are the most suitable planting materials, it is worth noting that the chairman of the Malaka Pinda Rubber Estates, Ltd., stated in his annual report that Tjikado and Prang Besar selected seed planted on 13 acres in August, 1929, yielded at the rate of 1,250 pounds per acre per annum during the last five months of 1940. Buddings planted on 27 acres of the same division at the same time, gave 1,123 pounds per annum during the same tapping period. Neither seedlings nor buddings had been tapped before.

AFRICA

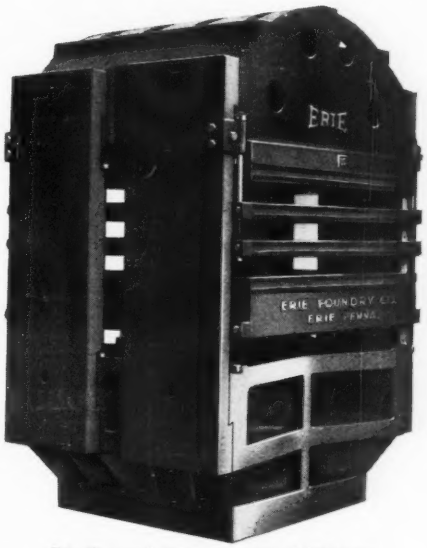
Recent statistics reveal that Africa for several years has steadily increased her exports of plantation rubber, which according to the International Rubber Regulation Committee, totaled 14,859 tons in 1939, an amount not equaled since 1914, when plantation rubber first took the lead from wild rubber. From 1920, when African rubber exports totaled 6,441 tons, to 1932, when they dropped to 1,917 tons, shipments fluctuated considerably, influenced by the rise and fall of world market prices. Since 1932, however, there has been a practically uninterrupted rise in exports. During the 1920-1939 period there has also been a considerable shifting in the order of importance of the different producing centers. While French Equatorial Africa led in 1920 with 32% of total shipments, its share was only 19% in 1928; while British Cameroons and Nigeria, which were apparently nowhere in the running eight years earlier, rose to first place with 31% of the total. A further change occurred when the plantations in Liberia began to yield. Exports from this territory were only 57 tons in 1920, but in 1939, according to the I. R. R. C., they were 5,435 tons, giving Liberia first place among African producers.

Total figures of exports, in tons from Africa follow:

Year	Exports	Year	Exports	Year	Exports
1920.....	6,441	1927.....	8,189	1934.....	3,362
1921.....	3,494	1928.....	7,455	1935.....	6,166
1922.....	2,941	1929.....	6,151	1936.....	8,691
1923.....	5,586	1930.....	4,871	1937.....	12,100
1924.....	5,416	1931.....	3,679	1938.....	11,814
1925.....	7,778	1932.....	1,917	1939.....	14,859
1926.....	9,501	1933.....	2,265		

Exports for 1941 are expected to double those of 1926.

HYDRAULIC PRESSES



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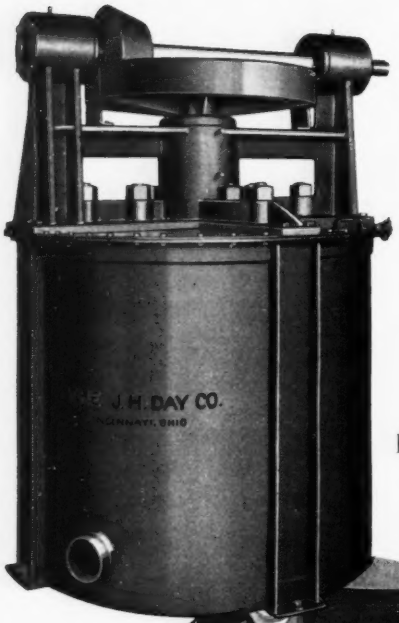

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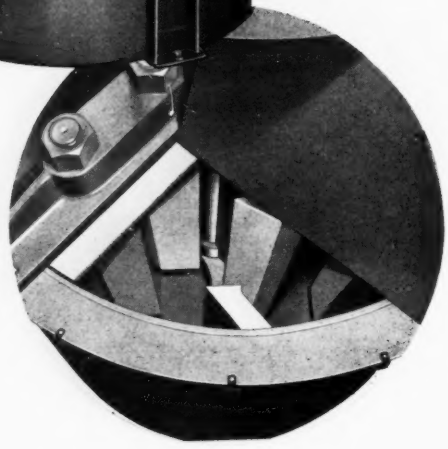

Interior View Showing Heavy Agitator Blades

The Day Hero Rubber Cement Mixer requires much less time for dissolving a batch than does the older type of mixer. Four sets of stationary blades, spaced at 90 degrees, extend downward from the top frame. Two sets of blades, spaced at 180 degrees, extending upward from heavy agitator arms located at the bottom of vertical shaft, rotate with the shaft.

The lower picture shows the blade section of the Day Rubber Cement Mixer, illustrating the close clearance between the stationary and the moving blades, which shear the rubber into smaller and smaller pieces, constantly exposing more surface to the action of the solvent.

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Editor's Book Table

BOOK REVIEWS

"Red Oxide of Iron—A Columbian Colloid for Rubber." Columbian Carbon Co., 41 E. 42nd St., New York, N. Y. 1940 Cloth, 5⅛ by 7¼ inches, 116 pages. Indexed.

This attractive and informative book is offered to the rubber industry with a two-fold purpose: to give some of the history of iron oxide pigments and to announce a new red oxide for rubber compounds. The story of iron oxides traces the evolution of manufacture from primitive methods to modern precipitation and calcination processes, briefly cites some early conceptions regarding their use and effect, and reviews iron oxide impurities and their significance in rubber compounding, with a chapter on testing methods for purity control.

The second part of the book deals with the new Mapico 297 oxide, describing its manufacture from copperas, its chemical composition and colloidal structure, tests results as graphs and supporting discussion relating to the physical properties imparted to rubber, and compounding applications with some type formulas. Of striking significance, as determined by the electron microscope, is a photograph with a magnification of 36,300 which shows the ultimate particles to be spheroidal in shape and approximately 60 m_μ in diameter. The observation is made that, in view of the colloidal structure and dimensions, true reenforcement should be imparted to rubber. Supporting evidence for this contention is presented in the section on physical properties. The book is completed with a summary of patents and a bibliography of literature references.

"The Chemical Action of Ultraviolet Rays." Carleton Ellis and Alfred A. Wells. Second Edition, revised and enlarged by Francis F. Heyroth. Published by Reinhold Publishing Corp., 330 W. 42nd St., New York, N. Y. 1941. Cloth, 6 by 9 inches, 951 pages. Indexed. Price $12.

This reference work on photochemistry, the second edition of an original work which appeared in 1925, contains three times as many pages as the first edition, incorporating much new data on the results of recent investigations and, in addition, modern theoretical concepts that have considerably altered the interpretation of photochemical action. There are 44 chapters divided into four parts. In Part I the various types of apparatus available for the production of ultraviolet rays are described in detail, with particular attention given to output energy. Part II discusses at length a few representative reactions and summarizes the literature of a wide variety of photochemical processes. In Part III the effects of light on individual products are treated, chiefly in a somewhat empirical manner; Part IV, with biological applications.

In a chapter on rubber, which contains 123 literature and patent references, attention is given to the action of ultraviolet rays in connection with polymerization and depolymerization, vulcanization, and oxidation. The question of accelerated weathering tests and the protection of rubber against the effects of ultraviolet radiation are dealt with in this chapter, while brief discussions are devoted to the effects of photochemical action as applied to chlorinated rubber and the bonding of rubber to other materials.

"1940 Supplement to A.S.T.M. Standards Including Tentative Standards. Part III. Nonmetallic Materials—General." Published by the American Society for Testing Materials, 260 S. Broad St., Philadelphia, Pa. Cloth, 6 by 9 inches, 575 pages. Price $3.

This supplement brings up to date the triennially published A.S.T.M. Book of Standards (Part III) on Nonmetallic materials: coal and coke, petroleum products and lubricants, electrical insulating materials, plastics, rubber products, textile materials, paper, etc. Of the 31 standards appearing in the 1940 supplement, 15 are newly adopted and 16 are replacements of existing standards in the 1939 book; similarly 39 of the 71 tentative standards are replacements; while the remaining 32 are published for the first time. Included in the volume are 21 new or revised standards relating to rubber.

"Handbook of Industrial Fabrics." Third Edition. George B. Haven. Published by Wellington Sears Co., 65 Worth St., New York, N. Y. 1941. Cloth, 5¼ by 7¾ inches, 789 pages. Index. Price $2.

Now in its third edition, this comprehensive handbook of industrial fabrics incorporates a number of important additions and revisions which will render it of even greater value to purchasing agents, engineers, and others responsible for specifying and inspecting fabrics, in addition to the many students who use the manual as a textbook. The subject matter continues to be divided into the following eight chapters: "Types of Cotton"; "Manufacturing Processes for the Cotton Fiber"; "Cotton Yarn"; "Uses of Industrial Fabrics"; "Organization and Properties of Industrial Fabrics"; "Laboratory Design and Practice"; "The Slide Rule, Logarithm and Nomograph"; "Specifications and Test Methods."

The new edition brings up to date the cotton tables and information on the marketing of cotton in Chapter I, gives new illustrations of textile machinery in Chapter II, and includes descriptions and photographs of new textile testing machinery in Chapter VI. Chapter VIII has been almost completely revised to incorporate new A.S.T.M. specifications of textiles as approved during 1940. Also, the bibliography of selected government publications on textiles has been enlarged. As in previous editions, much fundamental information is given on cotton textiles for use in rubber industry.

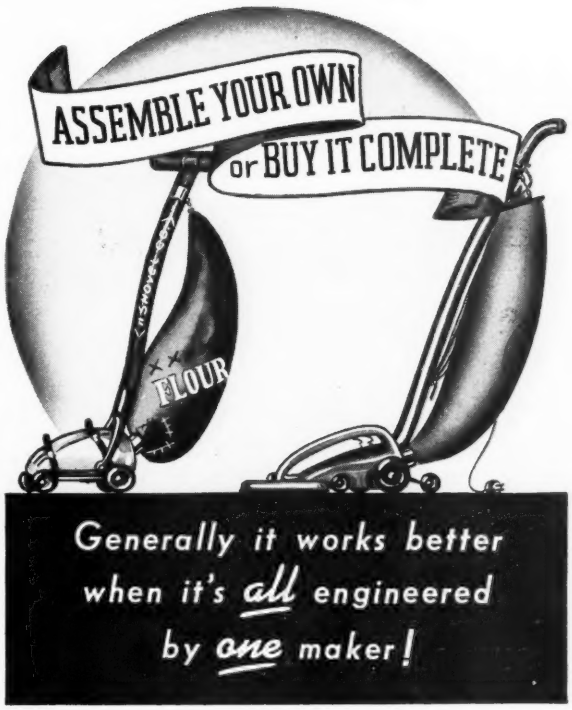
NEW PUBLICATIONS

"Hycar—A New and Important Group of Synthetic Rubbers." The Hydrocarbon Chemical & Rubber Co., Akron, O. 8 pages. Written in non-technical language, this booklet describes the physical characteristics of Hycar O. R., the first of a series of Hycar synthetic rubbers, lists the comparative properties of this synthetic and natural rubber, and pictures some of the steps in the manufacture of Hycar. The fact is emphasized that Hycar is handled like natural rubber in regard to storage, compounding, processing, and vulcanization. Some of the characteristics mentioned in connection with type O. R. are: resistance to oil, gasoline, vegetable oils, fats, and paint and ink driers; tensile strength of over 4,000 pounds per square inch with a 600% elongation; 35% superiority in abrasion resistance over similarly compounded natural rubber, according to laboratory tests; resistance to light, heat, and cold; and resistance to cold flow or creep.

"From Test Tubes to Tires—The Story of Chemigum." The Goodyear Tire & Rubber Co., Akron, O. 4 pages. This folder briefly relates in popular language the development of Chemigum, Goodyear's synthetic rubber; outlines its general physical and chemical characteristics; and indicates its possibilities in the event of a stoppage in the supply of crude rubber. Specific applications cited are: gasoline hose and hose nozzles, thermostat gaskets for automobile radiators, printer's supplies, valve and pipe gaskets, and hydraulic press pads used in forming various metal airplane parts.

"The Vanderbilt News." March-April, 1941. R. T. Vanderbilt Co., 230 Park Ave., New York, N. Y. 24 pages. The lead article in this issue sets forth data comparing the Bierer-Davis oxygen bomb test under 300 pounds' pressure at 70° and 80° C. Work on five different compounds shows that the same relative aging results are obtained at both temperatures, but that the rate of aging at 80° C. is at least twice as fast as that at 70° C. Future test work at the firm's laboratory will be conducted at the higher temperature, and the hope is expressed that other laboratories will adopt the same procedure. The current issue also contains photographs of rubber automotive parts, presented as part of the paper[1] by C. F. Smart and G. W. Lampman, of Pontiac Motor Division, at the Detroit meeting of the Rubber Division, A. C. S., last September; test data on Ty-Ply "Q", an improved bonding agent for vulcanizing rubber to metal; and a continuation of "X-Ray Studies of Rubber" by George L. Clark.

[1] The complete paper appeared in the March issue of INDIA RUBBER WORLD, pp. 43-47.



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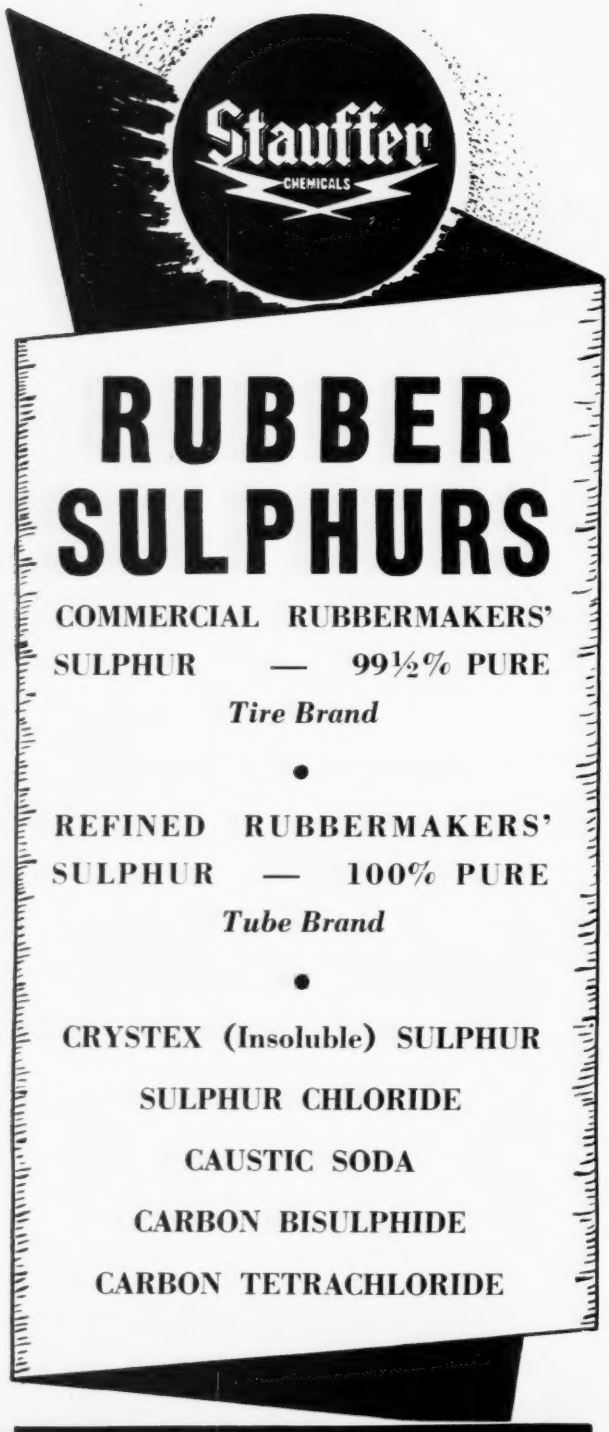

"Carbon Black Bulletin." March, 1941. Godfrey L. Cabot, Inc., 77 Franklin St., Boston, Mass. 4 pages. In the first article of this bulletin, "The Effect of Carbon Black on the Electrical Conductivity of rubber: Loading Study", graphical results on D. C. resistance, tensile strength, hardness, and modulus, plotted against carbon black loading are shown for three types of compound, using three different types of Cabot black. The inferences drawn from the study are that it is possible to obtain both high insulation and good reenforcement together and to obtain high conductivity even in cases where relatively low pigmentation is mandatory. A second article describes the procedure and apparatus for measuring D. C. resistance of rubber compounds as used in the firm's laboratory.

"B-L-E Antioxidant." Report No. 4012-1. Naugatuck Chemical Division of United States Rubber Co., 1230 Sixth Ave., New York, N. Y. 12 pages. Pertinent facts on B-L-E, a complex liquid reaction product of acetone and diphenylamine which has been used as an antioxidant for a period of years, are presented in this report. Some of the material's characteristic highlights set forth are: superior resistance to heat and oxidation; persistence for prolonged aging; ease of dispersion; and slight plasticizing effect. Comments are made on the use of B-L-E in a variety of stocks, and attention is called to the possibilities of antioxidant mixtures with B-L-E as one of the components. Uses of modifications, B-L-E—4 and B-L-E Powder, and the chemically similar Aminox are briefly referred to.

"The Romance of Rubber." United States Rubber Co., 1230 Sixth Ave., New York, N. Y. 48 pages. The purpose of this booklet, which describes rubber as our every-day servant, is to reveal some of the romantic past of rubber and tell of its present-day importance and versatility. Brief excerpts from the history of rubber are presented, followed by a description of activities at the firm's Sumatra plantation. Thereafter much is said about the multi-purpose application of rubber today. In conclusion, the story of "U. S." is briefly told from the date of its inception in 1892 to modern times, pointing out the firm's activities in producing raw rubber and rubber chemicals as well as the thousands of rubber products made in the company's 30 factories.

"Elastic Recovery and Plastic Flow in Raw Rubber." L. R. G. Treloar. Publication No. 1. The British Rubber Producers' Research Association, 19 Fenchurch St., London, E.C.3, England. 20 pages. This study, carried out as part of the program on fundamental research on rubber and reprinted from *Transactions of the Faraday Society*, attacks the problem of the separation of the elastic and plastic effects which in general take place simultaneously when raw rubber is subjected to deformation. In the experimental work every care was taken to remove the elastic strain after stretching to various extensions at different temperatures. Plastic flow is shown to pass through a maximum value with increasing elongation. Curves showing the decay of tension at constant extension, and the recovery of length after stretching, in conjunction with the observations on plastic flow, are interpreted in terms of a theory proposed by Busse.

"The Sporting Goods Trade Directory." Thirty-fifth Edition. *Sporting Goods Dealer*, St. Louis, Mo. 728 pages. Price 50¢. This classified index of goods made by sporting goods manufacturers has been brought up to date and rearranged in more convenient form. All items relating to a particular sport now are grouped under the heading for that sport instead of the alphabetical listings used in previous issues. A supplement index covers jobbers, manufacturers' representatives, importers, trade names, and other interesting and pertinent data.

"F & H Rubber Tired Wheels for Industry." French & Hecht, Inc., Springfield, O. 36 pages. This catalog, which points out the rapidly increasing use of rubber tires on wheeled industrial conveyances, gives specifications, prices, and illustrated details on the firm's line of rubber tired wheels and casters for industry. The tires include tubeless and inner-tube pneumatic, molded-on solid, and cushion types. Applications for agricultural equipment, highway grading and spreading machines, and airport ground equipment are also indicated.

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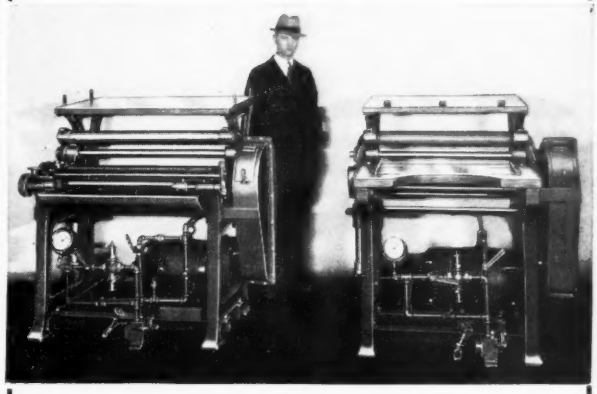
FARREL-BIRMINGHAM HOSE MACHINERY



Air Brake and Radiator Hose Machines. Left — Wrapping Machine. Right — Making and Covering Machine.

Improved Design Makes Operation Easier

Refinements of design incorporated in these Farrel-Birmingham Hose Machines for making, covering and wrapping air brake and radiator hose afford better control and easier operation. With more of the machines' functions made automatic, the operator can focus his attention mainly on the actual work of hose making, with the result that uniform quality is maintained, operation is more nearly continuous, output is increased and unit production costs are lowered.

Stepping on a pedal to operate an air valve raises or lowers the top roll without the aid of counterweights. Compressed air pressure on the top roll gives substantial, constant and even pressure, which results in a tightly wound and uniformly wrapped hose.

An inter-connected, electro-pneumatic system of control of the roll operating mechanism and the driving motor provides automatic starting and stopping of the machine. Foot operation of the air valve and switch leaves the hands free for handling the hose.

A compact, smooth-running drive is provided by the 3 HP geared motor mounted under the machine and driving the lower rolls through multi-V-belts and machine cut connecting gears.

Standard machines are designed to handle hose 1⅛" and 1⅜" inside diameter and 22" to 24" in length, but they can also be arranged for other sizes.

Full details will be sent on request, without obligation.

FARREL-BIRMINGHAM COMPANY, INC.
234 North Cliff St., Ansonia, Conn.

Patents and Trade Marks

APPLICATION

United States

2,231,008. **Device to Clean and Massage the Scalp.** A. F. Fois, Brooklyn, N. Y.

2,231,037. **Shock Absorbing Coupling Device** to Connect Two Relatively Rotatable and Relatively Axially Movable Elements. L. M. Taylor, Dayton, O.

2,231,038. **Electric Plug.** W. S. Thomas, Montoursville, assignor, by direct and mesne assignments, of 31⅔% to H. T. Flook, and 31⅔% to H. G. Meaker, both of Mansfield, all in Pa., and 5% to C. R. Nielsen, Washington, D. C.

2,231,046. **Washing Device** Including a Suction Cup. C. B. Woodson, San Francisco, Calif.

2,231,135. **Rubber-Blade Wiper Attachment** for Tubular Metalworking Machines. M. G. Murray, Ellwood City, Pa., assignor to National Tube Co., a corporation of N. J.

2,231,180. **Dress Shield.** K. McN. Bowman, Beverly Hills, and A. C. Caiati, Hollywood, both in Calif.; Caiati assignor to L. B. McNaught.

2,231,182. **Inner Tube** with Double Wall Section. E. Eger, Grosse Pointe Park, Mich., assignor to United States Rubber Co., New York, N. Y.

2,231,234. **Sponge Rubber Whisk Broom.** J. Weil, Brooklyn, N. Y.

2,231,285. **Vehicle Sway Bar.** D. E. Austin, Orchard Lake, assignor to General Motors Corp., Detroit, both in Mich.

2,231,346. **Sponge Rubber Seat Construction.** E. F. Riesing, A. E. Rathbun, and G. V. Soper, assignors to Firestone Tire & Rubber Co., all of Akron, O.

2,231,370. **Corrosion-Resistant Paint** Containing Chlorinated Rubber and Hardened Depolymerized Vulcanized Rubber. H. J. Reid, Fair Lawn, N. J., assignor, by mesne assignments, to United States Rubber Co., New York, N. Y.

2,231,418. **Intravenous Administering Apparatus** with Rubber Stopper. H. O. Trotter, assignor to Eli Lilly & Co., both of Indianapolis, Ind.

2,231,434. **Elasticized Stocking Top.** E. C. Cantner, Danville, Va., assignor to Danville Knitting Mills, a corporation of Va.

2,231,451. **Foundation Garment.** N. Melcher, assignor to Vanity Fair Silk Mills, both of Reading, Pa.

2,231,514. **Double Glass Sash** with Rubber Strip Sealing Air Cell between Panes. C. M. Verhagen, Elkhart, Ind., assignor to Adlake Co., Chicago, Ill.

2,231,551. **Shoe** with Rubber-Impregnated Fibrous Insole. A. C. Sewall, Auburn, Me.

2,231,552. **Insole and Material for Making It.** A. C. Sewall, Auburn, Me.

2,231,559. **Slip** with Elastic Fabric Back Panel. E. Cadous, Brooklyn, N. Y.

2,231,564. **Blood Transfusion Apparatus** with Resilient Plug. W. B. Cooksey, Detroit, Mich.

2,231,606. **Electrical Cable** with Heat- and Moisture-Resistant Insulation, Including Tapes of Asbestos and Plasticized Polyvinyl Halide (Synthetic.) H. J. Stewart, York, Pa., assignor to General Electric Co., a corporation of N. Y.

2,231,616. **Fishing Line.** G. Costantino, Astoria, L. I., assignor of 50% to C. Curtis, New York, both in N. Y.

2,231,651. **Power Reset Wringer.** H. W. Altorfer, Peoria, Ill.

2,231,690. **Fluid Rotary Pump Seal.** L. S. Sheldrick, Dearborn, and A. F. Eckert, Detroit, assignors to Ford Motor Co., Dearborn, Mich.

2,231,732. **Resilient Core** for Upholstery Units. F. A. Nachman and A. J. Schob, assignors to Nachman Springfield Corp., Chicago, Ill.

2,231,779. **Closure Member** for Collapsible Tube. C. C. Swartzel, Dayton, O.

2,231,800. **Headrest Attachment** with Elastic Straps. F. N. Cowman, Beverly Hills, Calif.

2,231,808. **Covered Elastic Thread and Elastic Fabric.** A. Isaac, Lyon, assignor to Dognin, Societe Anonyme, Villeurbanne, France.

2,231,847. **Golf Club** with Rubber Plug in Shaft. J. B. Dickson, Northampton, and A. Couture, Springfield, both in Mass., assignors to A. G. Spalding & Bros., Inc., New York, N. Y.

2,231,995 **Decorative and Protective Composite Sheet Covering Material** for Caskets and Other Structures. A. A. Glidden, Watertown, and I. D. Gardner, Quincy, assignors to Hood Rubber Co., Inc., Watertown, all in Mass.

2,232,041. **Electrical Insulating Sheet Material** Comprising Fibrous Material Impregnated with Polymerized Styrene. (Synthetic.) J. K. Webb, London, England, assignor to International Standard Electric Corp., New York, N. Y.

2,232,054. **Drainage Bag.** W. N. Daniels, New York, N. Y.

2,232,062. **Fabrication of Rubber Hydrochloride Sheet Material to Form Containers.** I. Gurwick, assignor to Shellmar Products Co., both of Mt. Vernon, O.

2,232,085. **Insulated Duplex Electric Conductor.** E. R. Troche, Towson, Md., assignor to Western Electric Co., Inc., New York, N. Y.

2,232,113. **Valve** for Hydraulic Brake Systems with Resilient Gasket. M. Katcher, New York, N. Y.

2,232,140. **Collapsible Tube** with a Slit Elastic Disk Closure. R. C. Rupp, Kendallville, Ind.

2,232,153. **Dialyser Diaphragm** of Tanned Polymerized Vinyl Composition. (Synthetic.) H. Vohrer, Berlin, Germany.

2,232,214. **Electrical Attachment Plug.** L. J. Clayton, assignor to Viceroy Mfg. Co., Ltd., both of Toronto, Ont., Canada.

2,232,222. **Supply Cable** for Vehicles and Collectors Theretor. H. V. Flinn, Rushorooke, Cobh, Irish Free State.

2,232,246. **Abdominal Anletic Supporter Device.** H. Klein, Detroit, Mich.

2,232,258. **Pessary.** W. K. McCormick and M. A. Stein, both of Windsor, Ont., Canada.

2,232,279. **Vent Plug** for Aircraft Batteries with Rubber Spring Closure. A. H. Snyder, Lancaster, N. Y., assignor to National Battery Co., St. Louis, Minn.

2,232,292. **Railroad Crossing** with Base of Semi-Resilient Material. L. E. Tisdale, Oklahoma City, Okla., assignor of 49% to J. N. Fields, Boulder City, Nev.

2,232,293. **Stuffing Box Packing.** E. Toennies, assignor to Vereinigte Deutsche Metallwerke A. G., both of Frankfurt a.M., Germany.

2,232,355 and 2,232,356. **Wiper.** D. C. Abdelnour, Port Chester, assignor to Sleetex Co., Inc., New York, both in N. Y.

2,232,378. **Wringer.** N. L. Etten, Waterloo, Iowa.

2,232,386. **Top Frame of Convertible Sedan Body** Including a Rubber Mounting. J. Hammerl, assignor to Packard Motor Car Co., both of Detroit, Mich.

2,232,389. **Abrasive Composition** Comprising a Sponge Rubber Base and a Combination of Elongated Organic and Inorganic Abrasive Fibers Carried by the Non-Porous Portions of the Base. G. Jurkat, Hoboken, N. J.

2,232,410. **Hand Stamp.** L. G. Smith, assignor to H. F. Young, both of Salt Lake City, Utah.

2,232,468. **Rubber-Bushed Brake Hanger Bracket** for Railway Car Truck. A. H. Oelkers, assignor to American Steel Foundries, both of Chicago, Ill.

2,232,480. **Windshield Wiper.** A. Schmid, assignor to Robert Bosch Gesellschaft mit beschrankter Haftung, both of Stuttgart, Germany.

2,232,530. **Rubber Valve Stem** with Two-Section Metal Insert. O. W. Hosking, Monroe, N. Y., assignor to Dill Mfg. Co., Cleveland, O.

2,232,570. **Beading Strip** with Sponge Rubber Head and Latexed Attaching Strip. L. Spraragen, assignor to Bridgeport Fabrics, Inc., both of Bridgeport, Conn.

2,232,637. **Flexible Coupling** with Deformable Fluid Pressure Container. W. P. Schmitter, assignor to Falk Corp., both of Milwaukee, Wis.

2,232,640. **Laminated Articles** from Sheets of Hydrochlorinated Rubber and Paper. D. B. Schwartzman, assignor to Protex Products Co., both of Jersey City, N. J.

2,232,646. **Sponge Rubber Parachute Seat Cushion.** R. M. Stone and A. E. Rathbun, assignors to Firestone Tire & Rubber Co., all of Akron, O.

2,232,658. **Wiper.** W. Fasig, P. A. Krider, and R. A. Roderick, all of Akron, O., and D. C. Adbelnour, Port Chester, assignors to Sleetex Co., Inc., New York, both in N. Y.

2,232,664. **Printing Blanket.** S. B. Meiley, Winchester, assignor to Dewey & Almy Chemical Co., North Cambridge, both in Mass.

2,232,667. **Resilient Mounting.** C. Saurer, assignor to Firestone Tire & Rubber Co., both of Akron, O.

2,232,739. **High-Pressure Pump Valve.** D. C. Sharp and T. W. Adiar, both of Houston, Tex.

2,232,757. **Windshield Cleaner.** J. C. Zeder, Detroit, assignor to Chrysler Corp., Highland Park, both in Mich.

2,232,846. **Insulated Conductor** with a Printed Composition Cellulose Identification Strip. E. Freydberg, assignor to Freydberg Bros., Inc., both of New York, N. Y.

2,232,847. **Friction Clutch** Having a Rubber Link. H. D. Geyer, Dayton, O., assignor to General Motors Corp., Detroit, Mich.

2,233,004. **Tire Inner Tube** with a Protective Elastic Flap for Rib Section. H. N. Fisher, Los Angeles, Calif.

2,233,051. **Railway Car Diaphragm.** L. A. Hansen, assignor to Pennsylvania Railroad Co., both of Philadelphia, Pa.

2,233,052. **Sheet Diaphragm** for Railway Cars. L. A. Hansen, assignor to Pennsylvania Railroad Co., both of Philadelphia, Pa.

2,233,067. **Electrical Contact Plug.** M. Alden, Brockton, Mass.

2,233,090. **Sheet Material** Adhesively Coated with a Composition of Wax, Rubber, Vinyl Resin, and Chlorinated Rubber. B. Asnes and E. L. Kallander, assignors to Dennison Mfg. Co., all of Framingham, Mass.

2,233,096. **Valve** for Inflatable Articles. H. Goldsmith, assignor to Sport Products, Inc., both of Cincinnati, O.

2,233,097. **Wooden Pattern** for Sand-Cement Foundry Molds with Protective Rubber Facing. J. H. Hall, Philadelphia, assignor to Birdsboro Steel Foundry & Machine Co., Birdsboro, both in Pa.

2,233,104. **Self-Alining Bearing** with Rubber Ring. E. F. Martinet, assignor to P. A. Geier Co., both of Cleveland, O.

2,233,116. **Toy Trailer Wagon.** F. F. Voorheis, Downers Grove, Ill.

2,233,173. **Molded Rubber Valve.** W. C. McCoy, Shaker Heights, O., assignor, by mesne assignments, to Jenkins Bros., Bridgeport, Conn.

2,233,186. **Cellulose Base Sheet** with Coating of Ester Gum, Paraffin Wax, and Rubber. R. S. Soanes, Toronto, assignor to Appleford Paper Products, Ltd., Hamilton, both in Ont., Canada.

2,233,209. **Surgical Dressing.** C. J. Herzog, assignor to Duke Laboratories, Inc., both of Stamford, Conn.

2,233,355. **Rubber-Cushioned Roller Skate.** R. R. Ware, assignor to Chicago Roller Skate Co., both of Chicago, Ill.

2,233,367. **Bookmarker** with Rubber Band Tensioning Means. R. S. Manzardo, Berne, assignor to H. F. Stoffel, Rorschach, both in Switzerland.

2,233,378. **Obstruction Remover** of Collapsible-Cup Type. J. R. Wilson, Lawton, Okla.

2,233,385-2,233,388. **Wringer.** W. L. Kauffman, II, assignor to Lovell Mfg. Co., both of Erie, Pa.

2,233,540. **Journal Box Mounting** with Rubber in Shear. E. Latshaw, assignor to J. G. Brill Co., both of Philadelphia, Pa.

2,233,544. **Reflector Attachment** for Shoes with Elastic Band Retaining Means. R. R. McKinley, Miami, Fla.

2,233,562. **Band Saw Wheel and Tire Therefor.** C. E. Tannewitz, Grand Rapids, Mich.

2,233,576. **Stiffening Member** for Shoes, Etc., P. A. Balon, Arlington, N. J., and H. S. Holt, assignors to Celastic Corp., both of Wilmington, Del.

2,233,627. **Equalizer Apparatus** for Vehicles Having Rubber Block Supports. H. T. McDonald, Peoria, Ill., assignor to Caterpillar Tractor Co., San Leandro, Calif.

2,233,742. **Safety Wheel** Including a Tire and an Extending Flange. L. R. Lowry, Sr., assignor of one-half to R. Stanley, both of Weatherford, Okla.

2,233,811. **Paste Applicator.** A. F. Dotz, Bridgeport, assignor of one-half to H. C. Folgmann, Waterbury, both in Conn.

2,233,870. **Suction-Type Fastener.** L. F. Muter, assignor to Muter Co., both of Chicago, Ill.

2,233,895. **Duplicating Machine** with Rubber-Faced Plate. L. Mestre, assignor to Style Duplicator Corp., both of New York, N. Y.

2,233,939. **Electrical Surge Absorber.** J. L. Miller, Hollinwood, England, assignor to Ferranti Electric, Inc., New York, N. Y.

2,233,945. **Packaging Materials** in a Rubber Hydrochloride Container. I. Gurwick, assignor to Shellmar Products Co., both of Mt. Vernon, O.

2,233,952. **Double-Paned Window** with Rubber Spacers. S. G. Lipsett, assignor to Robert Mitchell Co., Ltd., both of Montreal, P. Q., Canada.

2,233,985. **Rubber Card Apron.** T. M. Knowland, Belmont, and A. G. Russell, Longmeadow, assignors to Boston Woven Hose & Rubber Co., Cambridge, all in Mass.

2,233,995. **Temple Roll for Looms** Consisting of Synthetic Rubbers or Polymerized Vinyl Halides and Hairy Elements Embedded Therein. R. W. Cutler, Boston, Mass.

2,234,014. **Washing Machine Cabinet** with Sealing Strip. M. S. Vincent, Newton, Iowa.

2,234,046. **Catamenial Appliance.** I. N. Freud, Johnstown, Pa.

2,234,061. **Rubber Safety Cap** for Knitting-Needle Point. W. H. Porter, Northport, N. Y., and C. M. Porter, Lakeside, Pointe Claire, P. Q., Canada.

2,234,068. **Rubber-Insulated Conductor** Covered with a Tape Impregnated with a Conducting Rubber Compound. R. J. Wiseman, assignor to Okonite Co., both of Passaic, N. J.

2,234,079. **Fluid Dispenser.** T. W. Miller, assignor to Faultless Rubber Co., both of Ashland, O.

2,234,084. **Container Closure.** C. A. Rauh, assignor, by mesne assignments, to General Tire & Rubber Co., both of Akron, O.

2,234,121. **Sealing Strip and Joint.** H. V. Hedeen, assignor to Divco-Twin Truck Co., both of Detroit, Mich.

2,234,145. **Power Wringer, Etc.** W. L. Kauffman, II, assignor to Lovell Mfg. Co., both of Erie, Pa.

2,234,161. **Windshield Wiper.** R. A. Anderson and J. E. Reeve, both of Duluth, Minn.

Dominion of Canada

394,621. **Piston Packing.** N. A. Christensen, Cleveland, O., U. S. A.

394,664. **Milking Machine Teat Cup.** De Laval

Separator Co., New York, assignee of W. A. Scott, Poughkeepsie, both in N. Y., U. S. A.

394,666. **Upholstery Seat Construction.** Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont., assignee of W. H. Chapman, Birmingham, Warwickshire, England.

394,712. **Typewriter Sheet Feeder.** Royal Typewriter Co., Inc., New York, N. Y., assignee of H. J. Hart, West Hartford, Conn., both in the U. S. A.

394,812. **Suction Cleaner Motor Mounting.** P. A. Geier Co., assignee of E. M. Martinet, both of Cleveland, O., U. S. A.

394,905. **Tractor Tire Water Ga'e.** H. A. Farnsworth, Elkhart, Kans., U. S. A.

394,922. **Journal Lubricator** with Sponge Rubber Pressure Pad. R. W. Miller, Winona, Minn., U. S. A.

394,929. **Tire Tube.** E. A. Smith, Wilmington, Del., U. S. A.

United Kingdom

531,939. **Lung-Controlled Breathing Apparatus.** Auerges, A. G.

531,949. **Foundation Garments.** Charis Corp.

532,044. **Adhesives and Paper Sizings.** R. T. Vanderbilt Co., Inc.

532,060. **Foundation Garments.** A. H. Stevens, (Kops Bros., Inc.).

532,114. **Electrical Insulating Material.** Standard Telephones & Cables, Ltd., and T. R. Scott.

532,157. **Hollow Rubber Doll Structures.** Sun Rubber Co.

532,185. **Electric Cables.** British Insulated Cables, Ltd., J. R. S. Orchard, and H. B. Chapman.

532,196. **Reducing Corset.** R. & W. H. Symington & Co., and T. L. McGrath.

532,304. **Fenders, Etc.** O. F. Swanborough, F. H. Harding, and Avon India Rubber Co., Ltd.

532,384. **Electric Power Cables.** Standard Telephones & Cables, Ltd., and T. R. Scott.

532,487. **Electrical Insulating Materials.** British Thomson-Houston Co., Ltd.

532,534. **Non-Skid Tire.** M. C. O. Corp.

532,545. **Apparatus to Filter Fluid or Sift Solid Materials.** United States Rubber Co.

532,553. **Vehicle Wheels.** Dunlop Rubber Co., Ltd., P. B. Chatterton, and G. E. Sharp.

532,687. **Electric Power Cables.** Standard Telephones & Cables, Ltd., T. R. Scott, J. K. Webb, and S. G. Foord.

532,688. **Electric Cables.** Standard Telephones & Cables, Ltd., T. R. Scott, and J. K. Webb.

532,750. **Filtration of Liquids.** United States Rubber Co.

532,751. **Asbestos Fabric Covers** for Ironing Surfaces. United States Rubber Co.

PROCESS

United States

2,231,057. **Manufacturing a Thick Vulcanized Rubber Body** of Uniform Elasticity, by Progressively Heating a Single Ply of Unvulcanized Rubber to Vulcanizing Temperature, Assembling the Sheet Material in a Multiplicity of Plies to Form a Thick Body, and Then Applying Pressure and Further Heat to Vulcanize the Body Uniformly Throughout. E. O. Dieterich, deceased, late of Akron, O., by K. J. Dieterich, executrix, Akron, O., assignor to B. F. Goodrich Co., New York, N. Y.

2,231,083. **Transfer-Designed Rubber Articles.** (Latex.) J. S. C. Moody, Somerville, and H. M. Phinney, Cambridge, both in Mass.

2,231,159. **Producing a Piezoelectric Device** Capable of Providing Electric Tension When Subjected to Mechanical Stress and Vice Versa, Which Includes Freezing a Rubber Solution to a Solid While Subjecting the Solution to an Electrical Field to Orient the Rubber Molecules. E. Gerlach, assignor to Telefunken Gesellschaft für Drahtlose Telegraphie m.b.H., both of Berlin, Germany.

2,231,359. **Building Tires** from Cord Fabric. R. B. Day, Akron, O., assignor to Wingfoot Corp., Wilmington, Del.

2,231,415. **Rubber-Glass Eraser.** R. G. Roesch, assignor to Eraser Co., Inc., both Syracuse, N. Y.

2,231,769. **Treating Rubber Mountings** to Reduce Drifting, Which Comprises Stressing the Rubber after Optimum Vulcanization in a Direction Parallel to Its Normal Load Sustaining Direction, Heating the Rubber While Stressed, and Then Relieving the Stress. R. A. Merrill, Detroit, Mich., assignor, by mesne assignments, to United States Rubber Co., New York, N. Y.

2,231,950. **Manufacturing Closed Cell Expanded Rubber without Precure.** D. Roberts, New York, and R. C. Bascom, Merrick, assignors to Rubatex Products, Inc., New York, all in N. Y.

2,232,001. **Treading Tire Casings.** P. E. Hawkinson, assignor to Paul E. Hawkinson Co., both of Minneapolis, Minn.

2,232,109. **Articles with Relief Designs** in the Surface from Heat-Hardenable Plastic Stock, Which Comprises Temporarily Filling the Design Areas with a Finely Divided Material, Curing under Pressure, and Then Removing the Filling. W. A. Gibbons, Montclair, N. J., assignor, by mesne assignments, to United States Rubber Co., New York, N. Y.

2,232,216. **Making a Pair of Duplicate Heel Lifts,** Which Comprises Charging a Two-Part Mold with an Excess of Vulcanizable Material, Vulcanizing under Pressure, Removing the Molded Unit, and Simultaneously Sawing Unit in Half and Removing Flash. J. J. Daly, Hyannis, assignor to Daly Bros. Shoe Co., Inc., Boston, both in Mass.

3,233,274. **Elastic Fabric.** M. C. Teague, Ridgewood, N. J., assignor, by mesne assignments, to United States Rubber Co., New York, N. Y.

2,233,294. **Endless Belts.** (Latex.) A. B. Merrill and G. H. Stewart, both of Akron, O., assignors to B. F. Goodrich Co., New York, N. Y.

2,232,488. **Insertion of Thin Layers of Material Edgewise** in Cuts Formed in a Tire Tread. W. V. Smith, South Hadley Falls, Mass., assignor, by mesne assignments, to United States Rubber Co., New York, N. Y.

United Kingdom

531,990. **Puncture-Resistant Tire and Tubes** for Aircraft Wheels, Etc. Dunlop Rubber Co., Ltd., D. Bulgin, and P. G. Day.

532,464. **Rubber and Mineral Fiber Compositions.** E. E. Gaunt and Stillite Products, Ltd.

433,475. **Microporous Products.** United States Rubber Co.

532,628. **Rubber-Coated Electric Conductors.** International Latex Processes, Ltd.

MACHINERY

United States

2,231,254. **Recapping and Retreading Mold.** A. B. Cleveland, Los Angeles, Calif.

2,231,853. **Tire Building Apparatus.** D. A. Macdonald and C. M. O'Donohoe, Indianapolis, Ind., assignors, by mesne assignments, to United States Rubber Co., New York, N. Y.

2,232,091. **Power Transmission Mechanism.** H. T. Battin, Ridgewood, N. J., assignor to United States Rubber Co., New York, N. Y.

2,232,103. **Hydraulic Press and Electrical Control.** W. Ernst, Edison, and L. S. Hubbert, Mt. Gilead, both in O., assignors to Hydraulic Press Corp., Inc., Wilmington, Del.

2,232,487. **Machine to Make Tire Treads,** Which Comprises Means to Form a Cut, Means to Spread the Walls of a Cut, and Conveyor Means to Transport and Deposit Material in the Cut. W. V. Smith, South Hadley Falls, Mass., assignor by mesne assignments, to United States Rubber Co., New York, N. Y.

2,232,644. **Apparatus for Manufacturing Molded Articles** from Solid or Semi-solid Polymerization Products. W. Köhler, Munich, Germany.

2,232,760. **Full-Circle Recapping Vulcanizer.** B. Atkins, East Orange, N. J.

2,233,106. **Cable Sheathing Machine.** L. R. McGuire, Jackson Heights, assignor to Western Electric Co., Inc., New York, both in N. Y.

2,233,174. **Apparatus to Manufacture Contoured Sheets** from Vulcanizable Material. A. McDonald, assignor to Baldwin Rubber Co., both Pontiac, Mich.

2,233,543. **Machine for Beading Dipped Rubber Articles.** F. J. Maywald, Jr., Rutherford, N. J., assignor, by mesne assignments, to Frank B. Killian & Co., a partnership composed of Tyrrell, trustee, P. H., and L. S. Stevens, and M. Gusman, all of Akron, O.

2,233,555. **Apparatus for Making Thin Dipped Rubber Articles.** H. Reisinger, Trenton, N. J., assignor to Frank B. Killian & Co., Akron, O., a partnership composed of J. Tyrrell, trustee, P. H., and L. S. Stevens, and M. Gusman.

2,233,637. **Apparatus for Manufacturing Inner Tubes.** R. Patrick, Indianapolis, Ind., assignor, by mesne assignments, to United States Rubber Co., New York, N. Y.

2,233,755. **Slitting and Winding Machine.** W. M. Stocker, Hollis, assignor to Cameron Machine Co., Brooklyn, both in N. Y.

United Kingdom

532,057. **Rubber-Patch Vulcanizer** with Automatic Ignition. M. Schneller and Z. Molnar.

532,469. **Hydraulic Press.** J. Woodhead & Sons, Ltd., and T. H. Sanders.

532,883. **Hydraulic Presses.** J. Bradbury & Sons, Ltd., and V. Powell.

Germany

701,207. **Device to Roll Up Finished Seamless Hollow Goods.** H. Monnich, Berlin.

701,678. **Device to Burn Indentations in Tire Treads.** H. Nowak, Wuppertal-Elberfeld.

701,772. **Vulcanizing Press** for Making Rubber Matrices and Molds. Fischer & Krecke, G.m.b.H., Bielefeld.

CHEMICAL

United States

2,231,353. **Accelerator**—a 2-Arylene Thiazyl-2-Thio Thiodiazole. G. W. Watt, Austin, Tex., assignor to Wingfoot Corp., Wilmington, Del.

2,231,360. **Preparation of Chloropropionitriles.** J. D'Ianni, Akron, O., assignor to Wingfoot Corp., Wilmington, Del.

2,231,363. **Preparation of Alpha-Chloracrylonitrile.** J. R. Long, Akron, O., assignor to Wingfoot Corp., Wilmington, Del.

2,231,455. **Colored Titanium Pigments** (Blue, Yellow, and Neutral). H. H. Schaumann, Roselle, and R. K. Whitten, Edgewood Hills, both in Del., and R. W. Ball, Avondale, Pa., assignors to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,231,456. **Colored Titanium Pigment** (Buff). H. H. Schaumann, Roselle, and R. K. Whitten, Edgewood Hills, assignors to E. I. du Pont de Nemours & Co., Inc., Wilmington, all in Del.

2,231,595. **Electrical Insulating Composition** of Low Power Factor and Low Electrical Loss, Comprising Gamma Polyvinyl Chloride, Tricresyl Phosphate, and a Lead Phenolate. (Synthetic.) M. M. Safford, R. C. Feagin, and B. W. Nordlander, all of Schenectady, N. Y., assignors to General Electric Co., a corporation of N. Y.

2,231,623. **Synthetic Rubber-Like Material** Comprising a Copolymer of an Ester of Beta-(2-Furyl) Acrylic Acid and Butadiene-1, 3 and/or Its Methyl Homologs. B. J. Habgood, Rowland Hill, E. Isaacs, and L. B. Morgan, both of Blackley, Manchester, all in England, assignors to Imperial Chemical Industries, Ltd., a corporation of Great Britain.

2,231,838. **Preparation of Trichloropropionitrile.** J. G. Lichty, Stow, O., assignor to Wingfoot Corp., Wilmington, Del.

2,232,421. **Lubricant** Comprising a Hydrocarbon Oil and a Small Proportion of a Plastic Material Including an Organic Phosphine and an Organic Elastic Compound, e.g., Rubber, Halogenated Rubber, Synthesized Rubber, Gutta Percha, and Balata. A. R. Workman, Malverne, assignor to Cities Service Oil Co., New York, both in N. Y.

2,232,429. **Composition Comprising Chlorinated Rubber and the Halogenated Reaction Product of an Aromatic Hydrocarbon and a Hydrocarbon** Having at least One Halogen Atom Attached to an Acyclic Carbon Atom (Friedel-Crafts Catalyst). N. Bennett, Widnes, England, assignor to Imperial Chemical Industries Ltd., a coroporation of Great Britain.

2,232,515. **Synthetic Resin** Prepared by Interpolymerizing a Mixture of a Methacrylic Acid Ester and a 1, 3-Butadiene. H. W. Arnold and G. L. Dorough, assignors to E. I. du Pont de Nemours & Co., Inc., all of Wilmington, Del.

2,232,791. **Alcohol-Insoluble Cement**—Reaction Products of a Solution of Rubber and Perchloric Acid. E. C. Ladd, Highland Park, and N. J. Rakas, Royal Oak, assignors to Chrysler Corp., Highland Park, all in Mich.

2,232,869. **Recovery of Olefins** from Gaseous Mixtures of Olefins and Acetylene. R. F. Robey, Roselle, N. J., assignor to Standard Oil Development Co., a corporation of Del.

2,232,933. **Thermostable Composition** Consisting of polymerized Vinylidene for Vinyl Chloride and a Di-Aralkyl Ether of the Benzene Series or a Aralkyl Ether of Nuclear Hydroxylated Aromatic Compounds of the Benzene Series. (Synthetic.) R. M. Wiley and J. E. Livak, assignors to Dow Chemical Co., all of Midland, Mich.

2,232,944. **Manufacture of 1-Carbalkoxy-Butadienes-1,3.** H. Gudgeon and R. Hill, both of Blackley, Manchester, England, assignors to Imperial Chemical Industries Ltd., a corporation of Great Britain.

2,233,590. **Manufacture of Aliphatic Ketone-Diarylamine Antioxidants.** C. S. Dewey, Cheshire, Conn., assignor, by mesne assignments, to United States Rubber Co., New York, N. Y.

2,233,680. **Vulcanizing Rubber** in the Presence of a Mercapto-Aryl-Thiazole Accelerator and a Diaryl Substituted Guanidine Salt of Hydrochloric Acid. R. L. Sibley, Nitro, W. Va., assignor to Monsanto Chemical Co., St. Louis, Mo.

3,234,076. **Emulsion Polymerization of Butadienes** in the Presence of Water-Soluble Phthalocyanines Containing Heavy Metals. (Synthetic.) W. Gumlich, Leverkusen-Schlebusch, and I. Dennstedt, Cologne-Buchforst, Rhine, both in Germany, assignors, by mesne assignments, to Jasco, Inc., a corporation of La.

Dominion of Canada

394,660. **Synthetic Rubber-Like Compositions** Comprising: (1) Polyvinyl Halide and an Ester of Acetylated Ricinoleic Acid; (2) Polyvinyl Halide and an Ester of Acetylated Polymerized Ricinoleic Acid; and (3) Polyvinyl Chloride Plasticized with Acetylated Castor Oil. Canadian General Electric Co.,

Ltd., Toronto, Ont., assignee of M. C. Agens, Schenectady, N. Y., U. S. A.

394,953. **Electrical Insulating Compound** with Stable Electrical Losses at Elevated Temperature Comprising Plasticized Polyvinyl Chloride, Lead Resinate, and Fuller's Earth. (Synthetic.) Canadian General Electric Co., Ltd., Toronto, Ont., assignee of R. M. Fuoss, Schenectady, N. Y., U. S. A.

UNCLASSIFIED

United States

2,231,113. **Tire Traction Shoe.** H. J. Dozier, Philadelphia, Pa.

2,231,123. **Cementitious Composition** Utilizing Shredded Reclaimed Cotton from Tire Casings. D. S. Hubbell, assignor to H. H. Robertson Co., both of Pittsburgh, Pa.

2,231,183. **Sectional Wheel for Automobiles.** G. R. R. Flandes, Mexico, D. F., Mexico.

2,231,194. **Automobile Wheel and Hub Construction.** A. T. Peterson, St. Paul, assignor of one-half to H. V. Mercer, Minneapolis, both in Minn.

2,231,303. **Traction Device** for Tired Wheel. O. B. Strawn, Lewis, Kans.

2,231,745. **Vehicle Wheel.** J. W. Altmyer, Omaha, Nebr.

2,231,812. **Tire Inflating Apparatus** for Auto Wheel. T. Long and R. J. Dam, both of Englewood, N. J., assignors of one-third to M. E. White, Yonkers, N. Y.

2,231,948. **Wheel Balancing Weight.** H. H. Rickey, Pawtucket, R. I.

2,232,377. **Wringer Drive.** N. L. Etten, Waterloo, Iowa.

2,232,524. **Method of and Apparatus for Making an Extensible Retractile Electric Cord.** C. J. Hackbarth, Baltimore, Md., assignor to Western Electric Co., Inc., New York, N. Y.

2,232,706. **Wringer Safety Release.** W. L. Kauffman, II, assignor to Lovell Mfg. Co., both of Erie, Pa.

2,233,765. **Electric Cable Systems.** C. E. Bennet, Ridgewood, N. J., assignor to Okonite-Callender Cable Co., Inc., Paterson, N. J.

Dominion of Canada

394,669. **Airplane Wheel** for Pneumatic Tires. Firestone Tire & Rubber Co., Akron, O., assignee of B. H. Shinn, Butler, Pa., both in the U. S. A.

394,761. **Traction Attachment** for Rubber-Tired Tractor Wheel. S. E. Opperman, Barnet, Hertfordshire, England.

United Kingdom

532,452. **Tire-Inflating and Like Pumps.** R. Rutherford.

532,546. **Classification of Mixed Divided Material.** United States Rubber Co.

532,760. **Tire Valve-Connectors.** W. Turner and G. Askew.

532,796. **Non-Slip Rim** for Pneumatic-Tired Tractor Wheels, Etc. F. H. E. Marden.

TRADE MARKS

United States

375,605. **"Sturdi-Line."** Reducing girdles, etc. I. B. Kleinert Rubber Co., New York, N. Y.

375,614. **"Cort."** Dress shields. I. B. Kleinert Rubber Co., New York, N. Y.

375,615. **Mother and Daughter Store, Inc.** Clothing, footwear, etc. Mother & Daughter Stores, Inc., Rocky Mount, N. C.

375,616. **Loeser-Rite.** Shoes. Frederick Loeser & Co., Inc., Brooklyn, N. Y.

375,621. Representation of two columns of shoe outlines, each outline separated from the others by the repeated word: **"Zepplift",** crossing vertically and horizontally. Footwear, including heels of rubber and leather. I. Feldstein, doing business as Morris Feldstein & Son, New York, N. Y.

375,622. Representation of a label containing a sun, sun rays, and the words: **"Sun Wear Ltd."** Clothing and footwear. C. H. Cox, doing business as Sun Wear Ltd., New Bedford, Mass.

375,624. **Mono-Rib.** Tires. United States Rubber Co., New York, N. Y.

375,629. **Brake Action Tread.** Tires. United States Rubber Co., New York, N. Y.

375,633. **"Louise Lee."** Wearing apparel. Rubenstein Bros., Inc., Shreveport, La.

375,639. Representation of an oval containing the word: **"Wirk."** Workers uniforms, including rubber aprons, etc. Wirk Garment Corp., Chicago, Ill.

375,647. **Frederickson.** Tires and tubes. A. V. Swanson, doing busines as Frederickson Tire Co., Oklahoma City, Okla.

375,957. **The Plymouth Shoe.** Shoes. John E. Lucey Shoe Co., Middleboro, Mass.

376,245. **Converse Sno Pac.** Overshoes. Converse Rubber Co., Malden, Mass.

376,257. **Jean Lang.** Clothing. J. C. Lang, doing business as Gopher Sportswear Co., Minneapolis, Minn.

376,273. Representation of an elastic girdle enclosed in two concentric circles above the words: **"The Bias X concealed inside does the trick."** Girdles. Van-Sen, Inc., New York, N. Y.

376,391. **"Fit all."** Valve ball for flush tanks. Chicago Specialty Mfg. Co., St. Louis, Mo.

376,556. The word: **"Bedford"** between four fancifully designed polka-dots. Golf balls. Acushnet Process Co., Acushnet, Mass.

376,559. **Rodney Court.** Shoes. Mid-States Shoe Co., Milwaukee, Wis.

376,583. **Full Vision.** Gas masks. Acme Protection Equipment Co., Inc., Pittsburgh, Pa.

376,975. **Triple Toe.** Soles. A. G. Walton & Co., Inc., Chelsea, Mass.

377,256. **Wire Mold.** Brake linings. Raybestos-Manhattan, Inc., Passaic, N. J.

377,663. **Triple control.** Foundation garments. Artistic Foundations, Inc., New York, N. Y.

377,666. **Buzum-Hi.** Foundation garments. H. W. Gossard Co., Chicago, Ill.

377,673. **Geo. Master.** Clothing. George Master Garment Corp., Chicago, Ill.

377,895. **Bubly.** Chewing gum. Gumakers of America, Inc., Clifton Heights, Pa.

378,056. **Marshall.** Tires and tubes. Toledo Tire Corp., Toledo, O.

378,058. **High Speed Delivery.** Tires. Firestone Tire & Rubber Co., Akron, O.

378,199. **Kerry Keith ★★It's Smart to Dress Like the Stars★★.** Clothing and footwear. Schloss Bros. & Co., Inc., Baltimore, Md.

378,208. **Pendleton.** Electric batteries and parts. Penn Battery Mfg. Co., Inc., New York, N. Y.

378,215. **Styled by LondonTone.** Clothing including suspenders. Londontone Co., Oklahoma City, Okla.

378,679. **Wilby.** Sport articles, games, and accessories. William J. Beer Co., Inc., New York, N. Y.

378,700. **Manley.** Cutlery, machinery, tools, including tire tools, and parts thereof. American Chain & Cable Co., Inc., New York, N. Y.

378,854. **Pantie-Shield.** Sanitary shields. Formfit Co., Chicago, Ill.

378,861. **Balanced Pressure.** Windshield wiper blades. Lion Products Co., Lynn, Mass.

378,862. **De-Icer.** Windshield wiper blades. Lion Products Co., Lynn, Mass.

379,046. **Cammeyer Fifth Avenue.** Footwear. Cammeyer Fifth Ave., Inc., New York, N. Y.

379,050. **Xtra · Ease.** Shoes. Health Shoe Shop of Boston, Inc., Boston, Mass.

379,064. **Nat Lewis.** Wearing apparel. Nat Lewis Retail Corp., New York, N. Y.

379,177. **Rugged.** Golf balls. Fisk Rubber Corp., Chicopee Falls, Mass., assignor to United States Rubber Co., New York, N. Y.

379,178. **Safti-Base.** Inner tubes. Fisk Rubber Corp., Chicopee Falls, Mass., assignor to United States Rubber Co., New York, N. Y.

379,660. **Chisholms Beauty Step Styles.** Shoes. Chisholm Boot Shops, Inc., Cleveland, O.

379,961. **Stick-um-fast.** Cement. Stockwell Rubber Co., Inc., Philadelphia, Pa.

380,130. **Belmont Speed King.** Tires and tubes. Banner Tire Co., Boston, Mass.

380,526. **Spongeasy.** Rubber sponge mop. L. C. Osteen and J. D. Berry, both of Los Angeles, Calif.

380,532. The words: **"Stay-in-Form Foundations"** superimposed on the outline of a woman. Foundation garments. Stay-in-Form Foundations, New York, N. Y.

380,534. **Gimbels Milwaukeean.** Wearing apparel. Gimbel Bros., Inc., New York, N. Y.

380,752. **Armstrong's Cushion Cork.** Shoe composition of cork and rubber. Armstrong Cork Products Co., assignor to Armstrong Cork Co., both of Lancaster, Pa.

381,154. Representation of a rectangle containing the word: **"Jell·E·Seal."** Packages containing sealing and labeling materials. H. L. Odend'Hal, doing business as Jell-E-Seal Sales Co., Seattle, Wash.

381,160. **Kresge Sturdy Built.** Shoes. S. S. Kresge, doing business as Kresge Department Store, Newark, Newark, N. J.

381,162. **Chicagoan.** Clothing and footwear. Hub-Henry C. Lytton & Sons, Chicago, Ill.

381,167. **Character in Corsetry by Character Foundations New York.** Foundation garments. H. Kress, doing business as Character Foundations, New York, N. Y.

381,169. **American Nurse.** Shoes. Durand Shoe Co., Richmond, Me.

381,756. **Airspun.** Shoes. Tober-Saifer Shoe Co., St. Louis, Mo.

382,172. **MR Manhattan Hard Rubber Bowling Ball.** Bowling balls. Raybestos-Manhattan, Inc., Passaic, N. J.

382,355. **Tuf-Pins.** Bowling pins. Buffalo Rubber & Supply, Inc., Buffalo, N. Y.

382,362. **Hose-Pins.** Rubber clothes pins. Firestone Tire & Rubber Co., Akron, O.

382,564. **Saddle Moc.** Shoes. A. Sandler Co., Boston, Mass.

382,708. **Life.** Girdles, etc. Formfit Co., Chicago, Ill.

382,712. **Dixon Dependable Shoes.** Shoes. Freeman Shoe Corp., Beloit, Wis.

382,727. **Traun's Sterling.** Rubber combs. S & G Rubber Co., Inc., New York, N. Y.

383,284. **Lady Dawson.** Foundation garments. Loeber's, Inc., Cleveland, O.

383,535. **Vanderbilt.** Tires and tubes. Vanderbilt Tire & Rubber Corp., assignor to S. and H. Mufson, doing business as Fordham Tire Co., all of New York, N. Y.

383,540. **Ardmore.** Tires and tubes. Pharis Tire & Rubber Co., Newark, O.

383,700. **Kays-Newport.** Footwear. Kay's-Newport, Inc., Providence, R. I.

383,913. The letter: **"M"** in a white circle superimposed above a three-lobed figure above the word: **"Mac Gregor."** Golf clubs and balls, etc. Sport Products, Inc., Dayton, O.

384,021. **Dryfast.** Jackets. United States Rubber Co., New York, N. Y.

384,045. **Garment Gripper.** Waist band garment grippers. I. B. Kleinert Rubber Co., New York, N. Y.

384,397. **Kleen E-Z.** Mats. E. Stimson, Malcolm, Iowa.

384,619. Representation of a coat of arms containing the letters: **"A"** and **"F",** a banner containing the words: **"Ansonia De Luxe",** and a silhouette of a shoemaker enclosed in two concentric circles divided by a black band. Footwear. Ansonia De Luxe Shops, Inc., New York, N. Y.

384,621. **"Ezi-toes."** Shoes. Ettelbrick Shoe Co., Greenup, Ill.

384,712. **• Jane Taylor.** Clothing. Jane Taylor, Stylist, Los Angeles, Calif.

384,714. **Corsetcoat.** Corsets. Franco Corset Co., New York, N. Y.

384,718. **Brenda Gale.** Wearing apparel. Gimbel Bros., Inc., New York, N. Y.

384,721. Representation of an oval containing the words: **"Lady Douglas Vigorators."** Footwear. W. L. Douglas Shoe Co., Brockton, Mass.

384,729. **Re-Du-Sir.** Girdles., Marvelon, Inc., Pawtucket, R. I.

384,929. **Bubble-Foam.** Porous rubber latex. C. E. Zimmerman, Chicago, Ill.

384,943. **Undermates.** Women's undergarments. Blackton-Fifth Avenue, Ltd., New York, N. Y.

384,955. Representation of a label having a fanciful border and containing the word: **"Kure-Rite."** Inner tube repair kits. J. H. Parkinson, doing business as Kure-Rite Products Co., Syracuse, N. Y.

384,961. **Climax.** Adhesive tape. United States Rubber Co., New York, N. Y.

384,979. **Liberty Rubber.** Product composed of natural and/or synthetic rubber. B. F. Goodrich Co., New York, N. Y.

384,985. **Slak-ade.** Women's undergarments. Nieman-Marcus Co., Dallas, Tex.

385,013. Representation of a diamond containing the word: **"Amtico."** Rubber tile flooring. American Tile & Rubber Co., Trenton, N. J.

385,023. **Sturdi-nap.** Rubber sheeting, table covers, crib sheets. I. B. Kleinert Rubber Co., New York, N. Y.

385,024. Representation of a woman's silhouette below the word: **"Johnsonia."** Footwear. Endicott Johnson Corp., Endicott, N. Y.

385,107. **Crown.** Tubing, belting, rubber inserts, tires, inner tubes. Crown Products Co., Ralston, Nebr.

385,161. Representation of a winged man on top of the world, and the words: **"Firestone "Air Chief"** above and below. Air conditioning units. Firestone Tire & Rubber Co., Akron, O.

385,162. Representation of a label containing a head of a fox below the words: **"Firestone Red Fox."** Toy vehicles. Firestone Tire & Rubber Co., Akron, O.

385,222. **Turnpike.** Tires. Pennsylvania Rubber Co., Jeannette, Pa.

385,226. Representation of a black bar with the words: **"'Brevs' (Short Type Sheaths)"** in white. Prophylactics. R. H. Hinds, doing business as Crown Rubber Sundries Co., Akron, O.

385,297. **Patch-O-Tex.** Latex adhesive compositions. American Anode, Inc., Wilmington, Del.

385,346. Representation of a circle containing a fanciful drawing of a rubber tree being tapped, and the letters: **"R"** and **"X."** Normal and concentrated latex. Revertex Corp. of America, Brooklyn, N. Y.

385,356 **Firestone Safti-sured.** Tires and inner tubes. Firestone Tire & Rubber Co., Akron, O.

385,462. Representation of the sky-writing of the word: **"Airway"** by an airplane having the words: **"Fashioncraft, Inc."** on its wings. Raincoats. Fashioncraft, Inc., Cambridge, Mass.

385,478. **Hycar.** Natural and synthetic rubber compositions. Hydrocarbon Chemical & Rubber Co., Akron, O.

385,525. **Breathing Waist.** Foundation garments. Dominion Corset Co., Ltd., Quebec, P. Q., Canada.

385,545. **Pinfast.** Dress shields. Rand Rubber Co., Brooklyn, N. Y.

385,716. **Crofton.** Clothing, shoes, etc. Gimbel Bros., Inc., New York, N. Y.

Market Reviews

CRUDE RUBBER

Commodity Exchange

TABULATED WEEK-END CLOSING PRICES ON THE NEW YORK MARKET

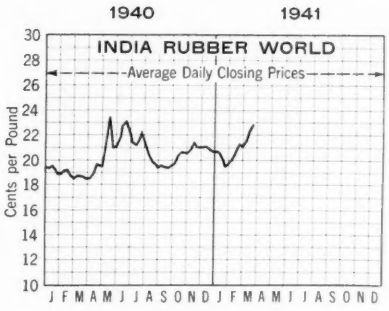
Futures	Jan. 25	Feb. 22	Mar. 1	Mar. 8	Mar. 15	Mar. 22
			"New" Standard			
Mar.	19.42	20.76	20.75	21.25	22.67	22.55
Apr.	.....	.....	20.70	21.20	22.58	22.50
July	19.22	20.20	20.20	20.60	21.95	22.00
Sept.	19.15	20.00	20.00	20.15	21.45	21.50
Dec.	19.05	19.80	19.83	19.95	21.20	21.35
Jan.	.....	19.75	19.78	19.75	21.00	21.25
			No. 1 Standard			
Mar.	19.42	20.76	20.71	21.25	22.67	22.55
May	19.30	20.72	20.70	21.15	22.48	22.45
Volume per week (ton)	3,970	5,610	7,110	6,560	6,330	3,870

AN AGGRAVATED shipping situation, heavy domestic consumption, and lower imports sent crude rubber prices last month to new highs for the year. May futures (old contract), which closed at 20.76¢ per pound on February 28, advanced sharply to reach 22.55¢ on March 21, and then eased somewhat to close at 22.20¢ per pound on March 25. Thereafter, the market was stronger, with May futures closing at 22.65¢ per pound on March 29.

It was reported that shipping space for 113,000 tons of rubber will be made available during April for shipment to the United States. On May 1 allocations of space on American flag vessels will begin, with probably the Rubber Reserve Co. obtaining about 50%, manufacturers buying in the Far East about 30%; and importers 20% of the available space.

Rubber consumption during February of 61,016 tons, continued at the record high daily rate established in January. Currently, the rubber manufacturing industry is believed to be working close to full effective capacity; it is expected that March consumption may reach 67,000 tons and thus possibly top the January figure of 64,225 tons. February imports were 73,973 tons, or 14.8% below the January figure. Lower imports with heavy consumption has tended to retard inventory accumulation, and this together with the tight shipping condition has caused concern over the spot supplies for May and June. Although the rubber priorities committee established on February 20 has effected no action on rubber usage yet, the possibility exists that conditions may be reached that would necessitate restrictions.

Net exports of rubber from both agreement and non-agreement countries during January totaled 138,907 tons, a record high which compares with 128,228 tons in December, 1940. International Rubber Regulation Committee figures show that, despite record U. S. consumption, world absorption of rubber decreased last year to 1,054,850 tons from 1,099,375 tons in 1939.



New York Outside Market—Spot No. 1-X Ribbed Smoked Sheets

New York Outside Market Rubber Quotations

		Mar. 27, 1940	Feb., 25, 1941	Mar. 28, 1941
Latex				
Normal, 38-40%,	*gal.*	$0.73/0.74	$0.80/0.81	$0.86/0.87
Centrifuged, 60-63%	*....gal.*	.. ..	1.37/1.38	1.48/1.49
Paras				
Upriver fine	*lb.*	.17⅛	.19¾	.22¼
Upriver fine	*lb.*	*.19¾	*.22	.*24½
Upriver coarse	*lb.*	.11½	.12¾	.14
Upriver coarse	*lb.*	*.17½	*.19	*.21
Islands fine	*lb.*	.17¾	.19	.22
Islands fine	*lb.*	*.19¾	*.21½	*.24
Acre, Bolivian fine	*lb.*	.17½	.20	.22½
Acre, Bolivian fine	*lb.*	*.20	*.22¼	*.25
Beni, Bolivian fine	*lb.*	.17½	.19	.22½
Madeira fine	*lb.*	.17⅛	.19¾	.22¼
Caucho				
Upper ball	*lb.*	.11½	.12½	.14
Upper ball	*lb.*	*.17¼	*.19	*.21
Lower ball	*lb.*	.11¼	.11¾	.13½
Pontianak				
Pressed block	*lb.*	.13/.18	.16½/.24	.16/.24
Guayule				
Ampar	*lb.*	.15	.15½	.15½
Africans				
Rio Nuñez	*lb.*	.18½	.18	.19
Black Kassai	*lb.*	.18½	.18½	.19½
Prime Niger flake	*lb.*	.22½	.22½	.30
Gutta Percha				
Gutta Siak	*lb.*	.17	.17½	.16
Gutta Soh	*lb.*	.28	.24	.24
Red Macassar	*lb.*	1.20	1.20	1.20
Balata				
Block Ciudad Bolivar	*lb.*	..	.45	.45
Manaos block	*lb.*	.45	.52	.52
Surinam sheets	*lb.*	.50	.51	.51
Amber	*lb.*	..	.53	.53

* Washed and dried crepe. Shipments from Brazil.

New York Outside Market

The outside market continued active last month, with heavy demand from factories. Off-grades and crepe were in sharp demand, and the price advances of these types were greater than even for smoked sheets, which scored sharp gains during March. No. 1-X ribbed smoked sheets, in cases, after closing at 21⅛¢ per pound on February 28, moved sharply higher during March to close at 23¢ per pound on March 24. The closing price on March 29 was 23⅛, with the market stronger.

Tire Production Statistics

	Pneumatic Casings		
	Inventory	Production	Shipments
1939	8,664,505	57,612,731	57,508,775
1940	9 178,537	59,352,643	59,155,326
1941			
Jan.	9,797,253	5,472,043	4,846,991
Feb.	10,071,857	5,165,404	4,910,365

	Pneumatic Casings		
	Original Equipment	Replacement Sales	Export Sales
1939	18,207,556	38,022,034	1,279,185
1940	22,261,723	35,724,034	1,169,569
1941			
Jan.	2,292,704	2,420,947	133,340
Feb.	2,547,285	2,216,684	146,396

	Inner Tubes		
	Inventory	Production	Shipments
1939	7,035,671	50,648,556	51,190,314
1940	7 014,154	52,350,867	52,306,767
1941			
Jan.	7,732,655	5,168,380	4,527,427
Feb.	8,004,383	4,993,131	4,712,828

	Inner Tubes		
	Original Equipment	Replacement Sales	Export Sales
1939	18,190,630	31,997,906	1,001,778
1940	22,181,862	29,134,442	990,463
1941			
Jan.	2,282,899	2,134,582	109,946
Feb.	2,547,081	2,034,488	131,259

Source: The Rubber Manufacturers Association, Inc. Figures adjusted to represent 100% of the industry.

New York Outside Market—Spot Closing Prices—Plantation Grades—Cents per Pound

	February, 1941					March, 1941														
	24	25	26	27	28	1	3	4	5	6	7	8	10	11	12	13	14	15	17	18	19	20	21	22
No. 1-X R.S.S. in cases*	21¼	21	21	21	21¼	21⅛	21⅛	21⅜	21½	21⅞	21⅝	21⅝	21⅞	22	22⅛	22⅝	22⅞	22⅞	22⅞	22¼	22⅞	23	23	23
No. 1 Thin Latex Crepe	21⅜	21⅛	21⅛	21⅛	21¾	21¾	21⅜	21⅝	21¾	22⅛	21⅞	21⅞	22⅛	22¼	22½	23	23¼	23¼	23¼	22⅞	23⅜	23⅛	23½	23½
No. 2 Thick Latex Crepe	21⅜	21⅛	21⅛	21⅛	21⅜	21¾	21⅜	21⅝	21¾	22⅛	21⅞	21⅞	22⅛	22¼	22½	23	23¼	23¼	23¼	22⅞	23⅜	23⅛	23½	23½
No. 1 Brown Crepe	19⅞	19⅝	19⅝	19⅝	20¼	20¼	20¼	20½	20⅝	21	20¾	20¾	21	21⅛	21¼	21¾	22¼	22¼	22¼	21⅞	22¼	22⅜	22⅜	22⅜
No. 2 Brown Crepe	19¾	19½	19½	19½	20	20	20	20¼	20⅜	20¾	20½	20½	20¾	20⅞	21	21½	22	22	22	21⅝	22	22⅛	22⅛	22⅛
No. 2 Amber	19⅞	19⅝	19⅝	19⅝	20¼	20¼	20¼	20½	20⅝	21	20¾	20¾	21	21⅛	21¼	21¾	22¼	22¼	22¼	21⅞	22¼	22⅜	22⅜	22⅜
No. 3 Amber	19¾	19½	19½	19½	20	20	20	20¼	20⅜	20¾	20½	20½	20¾	20⅞	21	21½	22	22	22	21⅝	22	22⅛	22⅛	22⅛
Rolled Brown	17¼	17	17	17	18½	18½	18½	18¾	18⅞	19¼	19	19	19¼	19⅜	19½	20	20¼	20¼	20¼	19⅞	20¼	21	21	21

*No. 1 Ribbed Smoked Sheets are ⅛¢ lower than No. 1-X R.S.S. in cases quoted here.

IMPORTS, CONSUMPTION, AND STOCKS

United States and World Statistics of Rubber Imports, Exports, Consumption, and Stocks—Long Tons

Twelve Months	U.S. Imports*	U.S. Consumption¶	U.S. Stocks Mfrs., Dealers, Importers, Etc.†¶	U.S. Warehouses, Afloat	U.K.—Public Liverpool†‡	Singapore and Penang Dealers and Port Stocks†‡	World Net Exports‡	World Absorption‡c	World Stocks†‡§
1938	400,178	437,031	231,500	45,105	86,853	27,084	870,300	942,252	596,498
1939	499,616	592,000	125,800	91,095	44,917*a*	15,299	988,600	1,110,358	447,666*a*
1940	818,102	618,349	340,857	153,169	.....	26,773	1,405,816	1,069,213	.....
1940									
Jan.	72,520	54,978	142,368*b*	90,285*b*	.....	35,928	129,558	106,073	.....
Feb.	43,088	49,832	134,328*b*	112,257*b*	.....	35,563	109,176	96,755	.....
Mar.	59,277	50,192	142,414*b*	113,619*b*	.....	23,830	100,690	102,282	.....
Apr.	70,699	50,103	162,459*b*	102,557*b*	.....	42,239	111,284	100,570	.....
May	51,431	51,619	161,446*b*	109,364*b*	.....	32,731	110,806	94,988	.....
June	53,889	46,506	168,235*b*	119,138*b*	.....	32,375	109,750	78,642	.....
July	69,596	47,011	190,222*b*	139,629*b*	.....	36,716	133,970	75,607	.....
Aug.	73,028	50,234	213,002*b*	141,286*b*	.....	40,395	118,498	80,011	.....
Sept.	78,973	50,206	241,358*b*	137,033*b*	.....	29,069	124,790	77,978	.....
Oct.	74,716	56,477	259,140*b*	166,837*b*	.....	33,638	104,310	87,216	.....
Nov.	72,901	54,652	276,943*b*	158,095*b*	.....	33,778	128,228	84,352	.....
Dec.	97,984	56,539	318,486*b*	145,950*b*	.....	26,773		84,739	.....
1941									
Jan.	86,833	64,225	340,857*b*	153,169*b*	.....	37,613	138,907	96,925	.....
Feb.	73,973	61,016	353,733*b*	136,855*b*	.....	.....	.....	.....	.....

*Including liquid latex. †Stocks on hand the last of the month or year. ‡*Statistical Bulletin of the International Rubber Regulation Committee.* §Stocks at U. S. A., U. K., Singapore and Penang, Para, Manaos, regulated areas, and afloat. ¶Corrected to 100% from estimate of reported coverage. *a* Stocks as of Aug. 31, 1939. *b* Includes government emergency rubber. *c* Including producing countries.

United States Reclaimed Rubber Statistics—Long Tons

Year	Production†	Consumption†	Consumption % of Crude	U.S. Stocks*†	Exports
1938	122,403	120,800	27.6	23,000	7,403
1939	186,000	170,000	28.7	25,250	12,611
1940	209,601	187,090	30.3	34,701	12,565
1940					
Jan.	19,297	16,070	29.2	27,418	1,059
Feb.	17,992	15,370	30.8	28,602	1,436
Mar.	17,234	15,931	31.7	28,488	1,420
Apr.	16,568	16,298	32.5	27,558	977
May	17,352	15,719	30.5	28,397	866
June	16,631	14,912	32.1	29,260	1,207
July	14,342	14,298	30.4	28,058	1,232
Aug.	17,213	14,224	28.3	29,786	1,300
Sept.	16,428	14,589	29.1	30,287	1,031
Oct.	19,358	16,528	29.3	32,118	716
Nov.	17,689	16,042	29.4	33,143	681
Dec.	19,297	17,109	30.2	34,701	640
1941					
Jan.	20,413	18,636	29.0	35,344	577
Feb.	19,507	17,793	29.2	37,104	...

*Stocks on hand the last of the month or year. †Corrected to 100% from estimates of reported coverage. *Compiled by The Rubber Manufacturers Association, Inc.*

RECLAIMED RUBBER

ACCORDING to R. M. A. figures, February reclaimed rubber consumption is estimated at 17,793 long tons, 4.5% below that of January; production, 19,507 long tons; and stocks on hand February 28, at 37,104 long tons. Consumption during March was reported to be running at about the same high level as the previous two months. According to the Department of Commerce, 1,293,051 pounds of reclaim were exported during January, with 1,060,353 pounds going to Canada. Prices are unrevised.

New York Quotations

March 26, 1941

	Sp. Grav.	¢ per lb.
Auto Tire		
Black Select	1.16-1.18	6 / 6¼
Acid	1.18-1.22	7 / 7¼
Shoe		
Standard	1.56-1.60	6½/ 6¾
Tubes		
Red Tube	1.15-1.30	9¼/ 9¾
Compound	1.10-1.20	9 /10¼
Miscellaneous		
Mechanical Blends	1.25-1.50	4⅝/ 5
White	1.35-1.50	12½/14

The above list includes those items or classes only that determine the price basis of all derivative reclaim grades. Every manufacturer produces a variety of special reclaims in each general group separately featuring characteristic properties of quality, workability, and gravity at special prices

Rubber Trade Inquiries

The inquiries below are of interest not only in showing the needs of the trade, but because information may be furnished by readers. The Editor is glad to have those interested communicate with him.

No.	Inquiry
2832	Manufacturers of rubber rug cushions in a waffle pattern.
2833	Manufacturers of rubber gas-mask parts.
2834	Suppliers of chicle.
2835	Manufacturer of "Thermofix" black rubber tubing.
2836	Manufacturer of ONOX foot bath trays.

THE R. M. A. estimated that United States rubber manufacturers consumed 61,016 long tons of crude rubber during February, 5% below January, but 22.4% more than in February, 1940.

Gross imports for February, as reported by the Department of Commerce, were 73,973 long tons, 14.8% under January, but 71.7% over February, 1940.

Total domestic stocks were estimated by the Association for February 28 to be 353,733 long tons, 3.8% over the stocks on hand January 31 and 163.3% over the stocks on hand February 29, 1940.

Stocks in the hands of the U. S. Government on February 28 were 145,570 long tons, 8.4% over January 31 stocks.

Crude rubber afloat to U. S. ports on February 28 was estimated at 136,955 long tons, 10.6% under January, but 22% above February, 1940.

RUBBER SCRAP

THE scrap market continued active in March. Owing to bad weather conditions, collections of scrap were reported relatively poor during the past two months, and dealers have been reluctant to sell at effective price levels. The scrap rubber collection situation is somewhat handicapped by the fact that scrap rubber is the cheapest of the various waste materials collected, and dealers must handle a relatively larger volume to realize comparable profits. Thus the preference tends to other types of waste materials. Scrap rubber exports during January, according to the Department of Commerce, totaled 8,207,934 pounds, against 9,459,357 in December, 1940.

The market is steady with price advances registered in only three grades: compound, red, and mixed tubes.

Consumers' Buying Prices

(Carlot Lots for March 26, 1941)

Boots and Shoes		Prices
Boots and shoes, black	*lb.*	$0.01¼/$0.01⅜
Colored	*lb.*	.01 / .01⅛
Untrimmed arctics	*lb.*	.007⅛/ .01
Inner Tubes		Prices
No. 1, floating	*lb.*	.11 / .12
No. 2, compound	*lb.*	.057⅛/ .06
Red	*lb*	.051¼/ .053⅛
Mixed tubes	*lb.*	.043⅛/ .045⅛
Tires (Akron District)		
Pneumatic Standard		
Mixed auto tires with beads	*ton*	15.00 /15.50
Beadless	*ton*	19.00 /19.50
Auto tire carcass	*ton*	45.00 /47.00
Black auto peelings	*ton*	46.00 /48.00
Solid		
Clean mixed truck	*ton*	34.00 /36.00
Light gravity	*ton*	42.00 /44.00
Mechanicals		
Mixed black scrap	*ton*	33.00 /34.00
Hose, air brake	*ton*	22.00 /24.00
Garden, rubber covered	*ton*	12.00 /14.00
Steam and water, soft	*ton*	12.00 /14.00
No. 1 red	*lb.*	.03¼/ .03½
No. 2 red	*lb.*	.02½/ .02¾
White druggists' sundries	*lb.*	.03¾/ .04
Mixed mechanicals	*lb.*	.02¼/ .02½
White mechanicals	*lb.*	.03¾/ .04
Hard Rubber		
No. 1 hard rubber	*lb.*	.11½/ .13

COMPOUNDING INGREDIENTS

THE demand for compounding ingredients by the rubber industry during March reached an even higher level than during the active months of February and January, with crude rubber consumption reported to be at an all-time peak. No immediate decrease in demand is foreseen. The major market development last month was the increase in carbon black prices noted below.

CARBON BLACK. Carbon black prices were advanced ¼¢ per pound, effective April 1, to 3¢ per pound in bulk, and 3.175¢ per pound in bags, both prices f.o.b. works. The domestic movement of black was at a high level although exports continued on a restricted basis. February shipments, which exceeded production by 5,000,000 pounds, were 43,000,000 pounds against 40,000,000 pounds in January. Producers' stocks on March 1 were 158,000,000 pounds.

FACTICE OR RUBBER SUBSTITUTE. The demand continued active, with prices generally steady.

LITHARGE. The price advanced 0.10¢ per pound for car lots and ¼¢ per pound for smaller quantities. Shipments were in large volume.

LITHOPONE. Demand was at a high level. Prices are firm, but unchanged.

RUBBER CHEMICALS. The demand for these chemicals was reported excellent last month and somewhat better than in the previous month. Prices are generally steady.

RUBBER SOLVENTS. Shipments ran at a better than seasonal level, and tire manufacturers called for large supplies. Prices are firm and unrevised.

TITANIUM PIGMENTS. Demand by the rubber industry was reported to be extremely good. Prices are unchanged.

ZINC OXIDE. The demand continues at a high rate. There is no indication of any shortage of American process zinc oxides, but, as indicated here last month, production of oxides made from the metal has been curtailed, compelling users to turn to the ore types. Prices are firm, but unchanged.

Current Quotations*

Abrasives

Pumicestone, powdered	lb.	$0.035	/$0.04
Rottenstone, domestic	lb.	.025	/ .03

Accelerators, Inorganic

Lime, hydrated, *l.c.l.*, New York	ton	20.00	
Litharge (commercial)	lb.	.08	

Accelerators, Organic

A-1	lb.	.24	/ .30
A-10	lb.	.31	/ .35
A-19	lb.	.52	/ .65
A-32	lb.	.70	/ .80
A-77	lb.	.42	/ .55
A-100	lb.	.42	/ .55
Accelerator 49	lb.	.41	/ .42
531	lb.	.48	/ .50
737	lb.	.42	/ .43
737-50	lb.	.25	/ .26
808	lb.	.70	/ .72
833	lb	1.15	
Acrin	lb.	$0.60	
Aldehyde ammonia	lb.	.65	/$0.70
Altax	lb.	.55	/ .60
B-J-F	lb.	.50	/ .55
Beutene	lb.	.70	/ .75
Butyl Eight	lb.	.98	/ 1.00
Zimate	lb.	2.15	
C-P-B	lb.	2.00	
Captax	lb.	.50	
Crylene	lb.		
Paste	lb.		
D-B-A	lb.	2.00	
Delac A	lb.	.40	/ .50
O	lb.	.40	/ .50
P	lb.	.40	/ .50
Di-Esterex-N	lb.	.60	/ .70
DOTG (Di-ortho-tolyguanidine)	lb.	.44	/ .46
DPG (Diphenylguanidine)	lb.	.35	/ .36
El-Sixty	lb.	.50	/ .65
Ethylidene aniline	lb.	.42	/ .43
Ethyl Zimate	lb.	2.15	
Formaldehyde P.A.C.	lb.	.06	
Formaldehyde-para-toluidine	lb.	.52	/ .54
Formaniline	lb.	.31	/ .32
Guantal	lb.	.40	/ .50
Hepteen	lb.	.35	/ .40
Base	lb.	1.35	/ 1.50
Hexamethylenetetramine U.S.P.	lb.	.39	
Technical	lb.	.33	
Lead oleate, No. 999	lb.	.14	
Witco	lb.	.15	
Ledate	lb.	2.00	
Monex	lb.	2.00	
Novex	lb.		
O-X-A-F	lb.	.50	/ .55
Oxynone	lb.	.70	/ .90
Para-nitroso-dimethylaniline	lb.	.85	
Pentex	lb.	1.00	/ 1.10
Flour	lb.	.15	/ .16
O	lb.		
Flour	lb.		
Phenex	lb.	.50	/ .55
Pip-Pip	lb.	2.50	
Pipsolene	lb.	1.55	/ 1.85
R-23	lb.	.40	
R & H 50-D	lb.	.42	/ .43
Rotax	lb.	.60	/ .65
Safex	lb.	1.20	/ 1.30
Santocure	lb.	.80	/ 1.00
Selenac	lb.	2.50	
SPDX	lb.	.70	/ .75
A	lb.	.70	/ .75
Super-sulphur No. 1	lb.	.50	
2	lb.	.18	/ .20
Tetrone A	lb.	2.35	
Thiocarbanilide	lb	.24	/ .30
Thionex	lb	2.00	
Thiurad	lb.	2.35	
Trimene	lb.	.55	/ .65
Base	lb.	1.05	/ 1.20
Triphenylguanidine (TPG)	lb.	.45	
Tuads	lb.	2.00	
2-MT	lb.	.54	
Ulto	lb.	1.25	/ 1.75
Ureka	lb.	.60	/ .75
Blend B	lb.	.60	/ .75
C	lb.	.56	/ .65
Vulcanex	lb.	.42	/ .43
Vulcanol	lb.	.85	
Z-B-X	lb.	2.50	
Zenite	lb.	.46	/ .48
A	lb.	.53	/ .55
B	lb.	.46	/ .48
Zimate (Methyl)	lb.	2.00	

Activators

Aero Ac 50	lb.	.46	/ .52
Barak	lb.	.50	
MODX	lb.	.30	/ .35
SL No. 10	lb.	.12	

Age Resisters

AgeRite Alba	lb.	2.00	
Exel	lb.	1.00	/ 1.02
Gel	lb.	.57	/ .59
Hipar	lb.	.65	/ .67
Powder	lb.	.52	/ .54
Resin	lb.	.52	/ .54
D	lb.	.52	/ .54
White	lb.	1.25	/ 1.40
Akroflex C	lb.	.56	/ .58
Albasan	lb.	.70	/ .75
Aminox	lb.	.52	/ .61
Antox	lb.	.56	
Betanox	lb.	.52	/ .61
Special	lb.	.65	/ .74
B-L-E	lb.	.52	/ .61
Powder	lb.	.65	/ .74
B-X-A	lb.	.52	/ .61
Copper Inhibitor X-872-A	lb.	1.15	
Flectol B	lb.	.52	/ .65
H	lb.	.52	/ .65
White	lb.	.90	/ 1.15
M-U-F	lb.	1.50	
Neozone (standard)	lb.	.63	
A	lb.	.52	/ .54
B	lb.	.63	
C	lb.	.52	/ .54
D	lb.	.52	/ .54
E	lb.	.63	
Oxynone	lb.	$0.64	/$0.80
Parazone	lb.	.68	
Permalux	lb.	1.20	
Santoflex B	lb.	.52	/ .65
BX	lb.	.58	/ .71
Santovar A	lb.	1.15	/ 1.40
Solux	lb.	1.30	
Stabilite	lb.	.52	/ .54
Alba	lb.	.70	/ .75
Thermoflex	lb.	1.20	/ 1.15
A	lb.	.65	/ .67
Tysonite	lb.	.16	/ .165
V-G-B	lb.	.52	/ .61

Alkalies

Caustic soda, flake, Columbia (400-*lb. drums*)	100 lbs.	2.70	/ 3.55
liquid, 50%	100 lbs.	1.95	
solid (700-*lb. drums*)	100 lbs.	2.30	/ 3.15

Antiscorch Materials

A-F-B	lb.	.35	/ .40
Antiscorch T	lb.	.90	
Cumar RH	lb.	.10	
E-S-E-N	lb.	.35	/ .40
R-17 Resin (*drums*)	lb.	.10	
RM	lb.	1.25	
Retarder W	lb.	.36	
Retardex	lb.	.45	/ .48
U-T-B	lb.	.35	/ .40

Antiseptics

Compound G-4	lb.		
G-11	lb.		

Antisun Materials

Heliozone	lb.	.22	/ .23
S.C.R.	lb.	.33	/ .35
Sunproof	lb.	.22	/ .27

Blowing Agents

Unicel	lb.	.50	

Brake Lining Saturant

B.R.T No. 3	lb.	.0165/	.0173

Colors

Black

Du Pont powder	lb.	.42	/ .44
Lampblack (commercial), *l.c.l.*	lb.	.15	

Blue

Du Pont Dispersed	lb.	.83	/ 3.95
Powders	lb.	2.25	/ 3.75
Toners	lb.	.08	/ 3.85

Brown

Mapico	lb.	.11	

Green

Chrome	lb.	.23	
oxide (*freight allowed*)	lb.		
Du Pont Dispersed	lb.	.98	/ 2.85
Powders	lb.	1.00	/ 5.50
Guignet's (*bbls.*)	lb.	.70	
Toners	lb.	.85	/ 3.75

Orange

Du Pont Dispersed	lb.	.88	/ 2.00
Powders	lb.	.88	/ 2.75
Toners	lb.	.40	/ 1.60

Orchid

Toners	lb.	1.50	/ 2.00

Pink

Toners	lb.	1.50	/ 2.00

Purple

Toners	lb.	.60	/ 2.10

Red

Antimony			
Crimson, 15/17%	lb.	.48	
R. M. P. No. 3	lb.	.48	
Sulphur free	lb.	.52	
R.M.P.	lb.	.52	
Golden 15/17%	lb.	.23	
7-A	lb.	.37	
Z-2	lb.	.23	
Cadmium, light (400-*lb. bbls.*)	lb.	.75	/ .80
Du Pont Dispersed	lb.	.93	/ 2.05
Powders	lb.	.285	/ 1.55
Mapico	lb.	.0925	
Rub-Er-Red (*bbls.*)	lb.	.0925	
Toners	lb.	.08	/ 2.00

White

Lithopone (*bags*)	lb.	.0385/	.0410
Albalith	lb.	.0385/	.0410
Astrolith (50-*lb. bags*)	lb.	.0385/	.0410
Azolith	lb.	.0385/	.0410
Titanium Pigments			
Ray-bar	lb.	.055	/ .065
Ray-cal	lb.	.0525/	.0625
Rayox	lb.	.135	/ .165
Titanolith (50-*lb. bags*)	lb.	.0525/	.055

*Prices in general are f.o.b. works. Range indicates grade or quantity variations. Space limitation prevents listing of known ingredients. Requests for information not recorded will receive prompt attention.

Titanox-A	lb.	$0.135	/$0.165
B	lb.	.055	/ .065
30	lb.	.055	/ .065
C	lb.	.0525	/ .0625
M	lb.	.055	/ .065
Ti-Tone	lb.		
Zopaque (50-lb. bags)	lb.	.135	/ .145
Zinc Oxide			
Azo ZZZ-11	lb.	.065	/ .0675
44	lb.	.065	/ .0675
55	lb.	.065	/ .0675
66	lb.	.075	/ .0775
French Process, Florence			
Green Seal-8	lb.	.0825/	.0850
Red Seal-9	lb.	.0775/	.08
White Seal-7	lb.	.0875/	.09
Kadox, Black Label-15	lb.	.065	/ .0675
No. 25	lb.	.0775/	.08
Red Label-17	lb.	.065	/ .0675
Horse Head Special 3	lb.	.065	/ .0675
XX Red-4	lb.	.065	/ .0675
23	lb.	.065	/ .0675
72	lb.	.065	/ .0675
78	lb.	.065	/ .0675
80	lb.	.065	/ .0675
103	lb.	.065	/ .0675
110	lb.	.065	/ .0675
St. Joe (lead free)			
Black Label	lb.	.065	/ .0675
Green Label	lb.	.065	/ .0675
Red Label	lb.	.065	/ .0675
U.S.P.	lb.	.0975/	.10
Zinc Sulphide Pigments			
Cryptone-BA-19	lb.	.0525/	.055
BT	lb.	.0525/	.055
CB	lb.	.0525/	.055
MS	lb.	.055	/ .0575
ZS No. 20	lb.	.0775/	.08
86	lb.	.0775/	.08
230	lb.	.0775/	.08
800	lb.	.0775/	.08
Sunolith	lb.	.0385/	.0410
Yellow			
Cadmolith (cadmium yellow), (400-lb. bbls.)	lb.	.50	/ .55
Du Pont Dispersed	lb.	1.25	/ 1.75
Powders	lb.	.135	/ 1.37
Mapico	lb.	.0675	
Toners	lb.	2.50	

Dispersing Agents

Bardex	lb.	.0395/	.042
Bardol	lb.	.0225/	.025
Darvan No. 1	lb.	.30	/ .34
No. 2	lb.	.30	/ .34
Nevoll (drums, c.l.)	lb.	.0225	
Santomerse S	lb.	.11	/ .25

Fillers, Inert

Asbestine, c.l.	ton	15.00	
Barytes	ton	30.00	/36.00
f.o.b., St. Louis (50-lb. paper bags)	ton	22.85	
off color, domestic	ton	21.50	/26.50
white, imported	ton	30.00	/36.00
Blanc fixe, dry, precip.	lb.	.03	/ .035
Calcene	ton	37.50	/43.00
Infusorial earth	lb.	.025	/ .03
Kalite No. 1	ton	24.00	/30.00
3	ton	34.00	/40.00
Kalvan	ton	95.00	
Magnesia, calcined, heavy	lb.		
Carbonate, l.c.l.	lb.	.0725/	.095
Paradene No. 2 (drums)	lb.	.045	
Pyrax A	ton	6.50	
Vinsol Resin	lb.		
Whiting			
Columbia Filler	ton	9.00	/14.00
Suprex, white extra light	ton	30.00	
heavy	ton	30.00	
Witco, c.l.	ton	6.00	

Finishes

Black-Out (surface protective)	gal.	4.00	/ 5.00
Rubber lacquer, clear	gal.	1.00	/ 2.00
colored	gal.	2.00	/ 3.50
Shoe Varnish	gal.	1.45	
Talc	ton	.025	/ .035

Flock

Cotton flock, dark	lb.	.09	/ .12
dyed	lb.	.40	/ .80
white	lb.	.12	/ .20
Rayon flock, colored	lb.	1.00	/ 2.00
white	lb.	.90	/ 1.00

Latex Compounding Ingredients

Accelerator 85	lb.	.35	
89	lb.	1.40	
122	lb.	1.55	
552	lb.	2.15	
Aerosol OT Aqueous 10%	lb.	.125	
Antox, dispersed	lb.	.42	
Aquarex D	lb.	.75	
F	lb.	.85	
Special WA Paste	lb.	.28	
Areskap No. 50	lb.	.18	/ .24
100, dry	lb.	.39	/ .51
Aresket No. 240	lb.	.16	/ .22
300, dry	lb.	.42	/ .50
Aresklene No. 375	lb.	.35	/ .50
400, dry	lb.	.51	/ .65
Black No. 25, dispersed	lb.	.22	/ .40
Collocarb	lb.	.07	
Color Pastes, dispersed	lb.	.38	/ 1.90
Copper Inhibitor X-872	lb.	2.25	
Dispersex No. 15	lb.	$0.11	/$0.12
No. 20	lb.	.08	/ .10
Factex Dispersion A	lb.	.16	
Heliozone, dispersed	lb.	.25	
Igepon A	lb.		
Latac	lb.	2.50	
MICRONEX, Colloidal	lb.	.055	/ .065
Nekal BX (dry)	lb.		
Pipsol X	lb.	3.05	/ 3.55
R-2 Crystals	lb.	2.50	/ 2.75
RN-2 Crystals	lb.	2.00	/ 2.25
S-1 (400 lb. drums)	lb.	.65	
Santobrite Briquettes	lb.		
Powder	lb.		
Santomerse D	lb.	.41	/ .65
S	lb.	.11	/ .25
Stablex A	lb.	.90	/ 1.10
B	lb.	.65	/ .90
C	lb.	.40	/ .50
Sulphur, dispersed	lb.	.10	/ .15
No. 2	lb.	.075	/ .12
T-1 (440-lb. drums)	lb.	.40	
Tepidone	lb.	1.03	
Vulcan Colors	lb.		
Zenite Special	lb.	.55	
Zinc oxide, dispersed	lb.	.12	/ .15

Mineral Rubber

Black Diamond	ton	25.00	
B.R.C. No. 20	lb.	.009	/.01
Hydrocarbon, hard	ton	23.00	/27.00
Genasco Hydrocarbon, granulated	ton		
solid	ton		
Gilsonite	ton		
Parmr	ton	23.00	/27.00
Pioneer	ton		
285°-300°	ton	23.00	/42.00

Mold Lubricants

Aluminum Stearate	lb.	.18	/ .19
Aquarex D	lb.	.75	
WA Paste	lb.	.25	
Special	lb	.28	
Lubrex	lb.	.25	/ .30
Mold Paste	lb.	.12	/ .18
Sericite	ton	65.00	/75.00
Soapbark	lb.		
Soapstone, l.c.l.	ton	25.00	/35.00

Oil Resistant

A-X-F	lb.	.82	/ .85

Reclaiming Oils

B.R.V.	lb.	.032	/ .0345
No. 1621	lb.	.019	/ .02
S.R.O.	lb.	.019	/ .02
X-159	gal.	.20	
Rox No. 1	lb.	.0225/	.025

Reenforcers

Carbon Black			
Aerfloted Arrow Specification (bags only)	lb.	.03175†	
Arrow Compact Granulized	lb.	.03175†	
Certified Heavy Compressed (bags only)	lb.	.03175†	
Spheron	lb.	.03175†	
Continental, dustless	lb.	.03175†	
Compressed (bags only)	lb.	.03175†	
Disperso	lb.	.03175†	
Dixie	lb.	.03175†	
Dixiedensed	lb.	.03175†	
66	lb.	.03175†	
Excello, dustless	lb.	.03175†	
Fumonex	lb.	.03	
ex. warehouses	lb.	.0525	/ .06
Gastex	lb.	.03	/ .07
Kosmobile	lb.	.03175†	
66	lb.	.03175†	
Kosmos	lb.	.03175†	
MICRONEX Beads	lb.	.03175†	
Mark II	lb.	.03325	
Standard	lb.	.03325	
W-5	lb.	.03325	
W-6	lb.	.03325	
P-33	lb.	.0475	
Pelletex	lb.	.03	/ .07
Supreme, dustless	lb.	.03175†	
Thermax	lb.	.02	
Velvetex	lb.	.04	/ .06
"WYEX BLACK"	lb.	.03175†	
Carbonex Flakes	lb.	.029	/ .034
S	lb.	.03	/ .0350
Clays			
Aerfloted Paragon (50-lb. bags)	ton	10.00	
Suprex (50-lb. bags)	ton	10.00	
Barden	ton	10.00	
Catalpo, c.l.	ton	30.00	
Chicora	ton	10.00	
China	ton	22.50	
Crown	ton	10.00	
Dixie	ton	10.00	
Hi-White	ton	10.00	
Langford	ton	7.50	
McNamee	ton	10.00	
Par	ton	10.00	
Paraforce, c.l.	ton	60.00	
Witco, c.l.	ton	10.00	

†Price quoted is f.o.b. works (bags). The price f.o.b. works (bulk) is $0.03 per pound; f.o.b. Hoboken (bulk) $0.0397; f.o.b. No. Atlantic Docks (bags), $0.0415. All prices are carlot.

Cumar EX	lb.	$0.045	
MH	lb.	.06	/$0.11
V	lb.	.09	/ .12
Silene	lb.	.04	/ .045

Reodorants

Amora A	lb.		
B	lb.		
C	lb.		
D	lb.		
Curodex 19	lb.		
188	lb.		
198	lb.		
Para-Dors	lb.		
Rodo No. 0	lb.	3.50	/ 4.00
10	lb.	4.50	/ 5.00

Rubber Substitutes

Black	lb.	.08	/ .12
Brown	lb.	.08	/ .115
White	lb.	.085	/ .135
Factice			
Amberex	lb.	.3025	
Type B	lb.	.1875	
Brown	lb.	.075	/ .115
Fac-Cel B	lb.	.1325	
C	lb.	.1325	
Neophax A	lb.	.093	
B	lb.	.093	
White	lb.	.085	/ .13

Softeners

B.R.T. No. 7	lb.	.0165/	.0175
Bondogen	lb.	.98	/ 1.05
Burgundy pitch	lb.		
Copene Resin	lb.	.20	
Cycline oil	gal.	.14	/ .20
Dispersing Oil No. 10	lb.	.0335/	.036
Nuba resinous pitch (drums)			
Grades No. 1 and No. 2	lb.	.0265	
3-X	lb.	.04	
Nypene Resin	lb.	.016	/ .0165
Palm oil (Witco), c.l.	lb.		
Palmol	lb.	.13	
Para Flux	gal.	.17	/ .18
No. 2016	gal.	.19	/ .20
Para Lube	lb.	.0425/	.048
Pine tar	gal.		
Plastogen	lb.	.0775/	.08
Plastone	lb.	.27	/ .30
R-19 Resin (drums)	lb.	.10	
21 Resin (drums)	lb.	.10	
Reogen	lb.	.12	/ .18
RPA No. 1	lb.	.65	
2	lb.	.65	
3	lb.	.46	
Tackol	lb.	.083	/ .18
Tonox	lb.	.52	/ .61
Tonox D	lb.	.75	/ .85
Witco No. 20, l.c.l.	gal.	.20	
X-1 resinous oil (tank car)	lb.	.01	

Softeners for Hard Rubber Compounding

Resin C, Pitch 45°C. M.P.	lb.	.013	/ .014
60°C. M.P.	lb.	.013	/ .014
75°C. M.P.	lb.	.013	/ .014

Solvents

Beta-Trichlorethane	gal.		
Cosol No. 1	gal.	.25	/ .30
No. 2	gal.	.20	/ .28
No. 3	gal.	.20	/ .28
Industrial 90% benzol (tank car)	gal.	.14	
Skellysolve	gal.		

Stabilizers for Cure

Calcium Stearate	lb.	.205	/ .225
Laurex (bags)	lb.	.1025/	.1275
Stearex B	lb.	.105	/ .115
Beads	lb.	.10	/ .11
Stearic acid, single pressed	lb.	.105	/ .115
Stearite, c.l.	lb.	.10	
Zinc stearate	lb.	.23	/ .25

Synthetic Rubber

Neoprene Type E	lb.	.65	
G	lb.	.70	
GN	lb.	.65	
I	lb.	.70	
KN	lb.	.75	
M	lb.	.65	
Latex Type 56	lb.	.30	
57	lb.	.30	
Synthetic 190	lb.	.41	

Tackifier

B.R.H. No. 2	lb.	.017	/ .02

Vulcanizing Ingredients

Magnesia, light (for neoprene)	lb.	.25	
Sulphur	100 lbs.	2.00	
Chloride (drums)	lb.	.04	
Telloy	lb.	1.75	
Vandex	lb.	1.75	
(See also Colors—Antimony)			

Waxes

Carnauba, No. 3 chalky	lb.	.57	
2 N.C.	lb.	.65	
3 N.C.	lb.	.61	
1 Yellow	lb.	.69	/ .715
2	lb.	.68	/ .705
Montan, crude	lb.		

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Drills

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COTTON AND FABRICS

NEW YORK COTTON EXCHANGE WEEK-END CLOSING PRICES

Futures	Jan. 25	Feb. 22	Mar. 1	Mar. 8	Mar. 15	Mar. 22
Mar.	10.40	10.30	10.43	10.53	.....	.....
Apr.	.....	.....	10.42	10.51	10.84	10.80
July	10.34	10.15	10.31	10.45	10.82	10.74
Sept.	10.03	9.89	10.07	10.35	10.78	10.67
Dec.	9.38	9.76	9.94	10.27	10.75	10.63
Jan.	.....	9.73	9.93	10.25	10.74	10.61
Mar.	.....	.....	.....	.....	10.73	10.59

New York Quotations

March 24, 1941

Drills

38-inch 2.00-yard	yd.	$0.01[illegible]
40-inch 3.47-yard		.09
50-inch 1.52-yard		.21½
52-inch 1.85-yard		.17⅞
52-inch 1.90-yard	.17⅜	.18
52-inch 2.20-yard		.17⅜
52-inch 2.50-yard		.15⅞
59-inch 1.85-yard		.18½

Ducks

38-inch 2.00-yard D. F.	yd. .15	.15½
40-inch 1.45-yard S. F.		.21⅜
51½-inch 1.35-yard D. F.		.22¼
72-inch 1.05-yard D. F.	.31⅜	.31½
72-inch 17.21 ounce		.35½

Mechanicals

Hose and belting	lb	.31

Tennis

51½-inch 1.35-yard	yd.	.24⅛
51½-inch 1.60-yard	yd.	.20½
51½-inch 1.90 yard	yd	.17⅛

Hollands

Gold Seal

20-inch No. 72	yd	.11½
30-inch No. 72		.20½
40-inch No. 72		.23
50-inch No. 72		.31

Red Seal

20-inch	yd.	.10
30-inch		.18⅛
40-inch		.20
50-inch		.29

Osnaburgs

40-inch 2.34-yard	yd.	.13
40-inch 2.48-yard		.12¼
40-inch 2.56-yard		.10⅝
40-inch 3.00-yard		.11⅛
40-inch 7-ounce part waste		.11⅜
40-inch 10-ounce part waste		.16
37-inch 2.42-yard		.12½

Raincoat Fabrics

Cotton

Bombazine 60 x 64	yd	.09¾
Plaids 60 x 48		.12½
Surface prints 60 x 64		.13½
Print cloth, 38½-inch, 60 x 64		.07¼

Sheetings, 40-Inch

48 x 48, 2.50-yard	yd.	.11
64 x 68, 3.15-yard		.10
56 x 60, 3.60-yard		.09
44 x 40, 4.25-yard		.07½

Sheetings, 36-Inch

48 x 48, 5.00-yard	yd.	.06⅜
44 x 40, 6.15-yard		.05⅜

Tire Fabrics

Builder

17¼ ounce 60" 23/11 ply Karded peeler	lb.	.30

Chafer

14 ounce 60" 20/8 ply Karded peeler	lb.	.29½
9¾ ounce 60" 10/2 ply Karded peeler	lb.	.29

Cord Fabrics

23/5/3 Karded peeler, 1 1/32" cotton	lb.	.30½
15/3/3 Karded peeler, 1 1/32" cotton	lb.	.28½
12/4/2 Karded peeler, 1 1/32" cotton	lb.	.27½
23/5/3 Karded peeler, 1¼" cotton	lb.	.36
23/5/3 Combed Egyptian	lb.	.49½

Leno Breaker

8¼ ounce and 10¼ ounce 60" Karded peeler	lb.	.32

THE cotton market strengthened last month, with the sharpest gains made in new crop futures. The New York 1 1/32-inch spot middling price advanced from 10.94¢ per pound on February 28 to close at 11.20¢ on March 19, and then declined to close at 11.11¢ on March 25. Thereafter the market was stronger, and the closing price on March 29 was 11.61¢.

Consumption of cotton in domestic mills during February totaled 793,626 bales, a new high for that month, which compares with 843,274 bales in January and 661,771 in February, 1940. The February daily rate of use was the highest on record. For the seven months, August through February, consumption reached a new record peak of 5,220,917 bales, against 4,703,707 a year ago. Exports in February were 60,597 bales, against 52,184 in January. For seven months, exports totaled 724,729 bales, against 4,916,511 a year ago.

Considerable activity was reported in Washington last month on farm legislation, but no final action was taken on pending legislation. The Bankhead 100% parity loan bill was ordered reported to the Senate by the Senate Agricultural Committee. This bill provides for cutting the crop to probable demand levels and for establishing prices of parity, 15.87¢ per pound in the case of cotton.

The Department of Commerce issued its first report last month on consumption of raw cotton in the United States, according to classes of goods manufactured. The report which covers the period from July 1 to December 31 of the current cotton season, shows that tire fabric (cords) consumed 7.4% of the total.

Fabrics

The fabrics market in March was extremely active, with deliveries before the third quarter practically non-existent, and buyers are disposed to place orders for third- and fourth-quarter delivery. Although somewhat early for the spring season, raincoats moved rather freely last month, and some buyers were reported placing orders for fall delivery.

The market continues to advance sharply, and fabrics in all groups are at higher price levels, except tire fabrics, which are steady and unchanged. This market strength, predicted here during the past few months, is expected to develop further over the next two or three months.

Committee D-11

(*Continued from page 56*)

Use in Evaluating the Appearance of Materials," follow. "Introduction to color", Deane B. Judd, National Bureau of Standards; "Color of Transparent Materials", Francis Scofield, National Paint, Varnish & Lacquer Assn., Inc.; "Hiding Power and Opacity", R. H. Sawyer, Krebs Pigment & Color Corp.; "Color Standards for Opaque Materials", I. H. Godlove, du Pont; "The Spectrophotometer in the Determination of the Color of Materials", A. E. Parker, Electrical Testing Laboratories; and "Photoelectric Colorimetry", Richard S. Hunter, National Bureau of Standards. The papers and discussion covering each of these symposiums will be issued in special publications during the early summer.

Pentex O Accelerator

PENTEX O, a product of the Naugatuck Chemical Division of United States Rubber Co., 1230 Sixth Ave., New York, N. Y., is a delayed action thiuram accelerator, equivalent to the well-known Pentex in all respects except that the former imparts substantially no odor to rubber goods. Pentex O is said to be fast curing, but safe to handle because of its pronounced delay in action. Other characteristics are: non-discoloring; readily dispersed because of its liquid form; effective at usual curing temperatures, but not effective with very low sulphur; only slightly retarded by carbon black and clay; and non-scorching with alkali reclaim. Alone the new accelerator is for use in mold cured stocks, and in combination with a thiazole-type accelerator it can be used to advantage in carbon black stocks. Particular advantages are said to be offered in the case of sponge rubber, insulated wire, and tire treads. A supplementary product, Pentex O Flour, is a powder made from Pentex O with a clay base. It is one-eighth as strong as liquid Pentex O and has a specific gravity of 2.46.

Unicel—A Blowing Agent for Sponge Rubber

UNICEL (chemically, diazo-aminobenzene) decomposes at normal curing temperatures, liberating nitrogen which expands and sponges the rubber containing it. In most cases, 2% on the rubber is sufficient. According to the manufacturer, E. I. du Pont de Nemours & Co., Inc., Wilmington, Del., Unicel produces a sponge rubber of uniform cell structure; it is not sensitive to variations in plasticity of rubber, and it saves "breakdown" time because the crude rubber does not have to be highly plasticized to obtain a good sponge. Good results are said to be obtained in both gum and highly loaded compounds; while Unicel stocks have good aging qualities. Unicel alone produces a sponge with small cells. If larger cells are desired, water or alcohol may be used with the blowing agent. Unicel works equally well in the case of neoprene, and it can be used advantageously in conjunction with soda blowing agents.

The Thermoid Co., Trenton, N. J., and domestic subsidiaries for February, 1941, recorded the largest gross sales for any month in its history, $855,217, contrasted with $658,723 in February, 1940.

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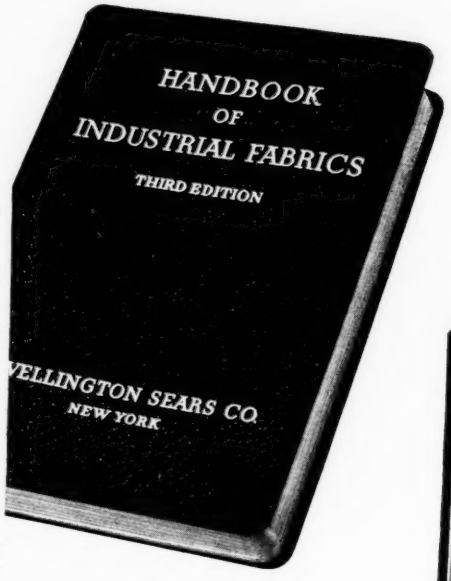

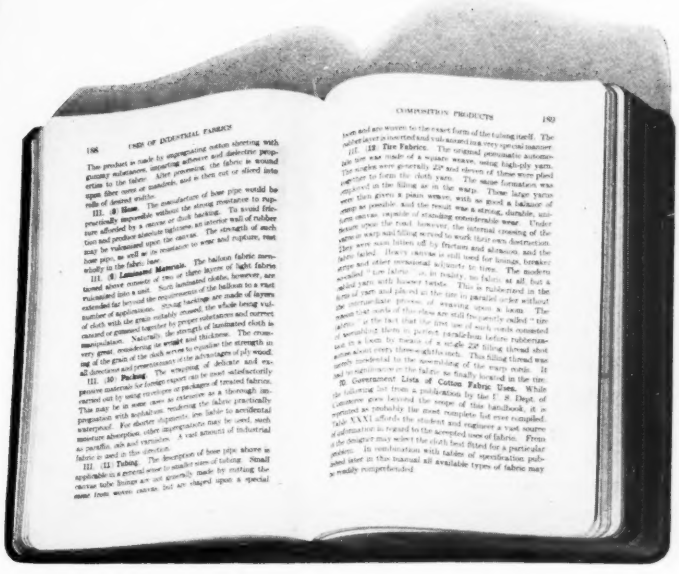

Professor George B. Haven
Massachusetts Institute of Technology — Editor

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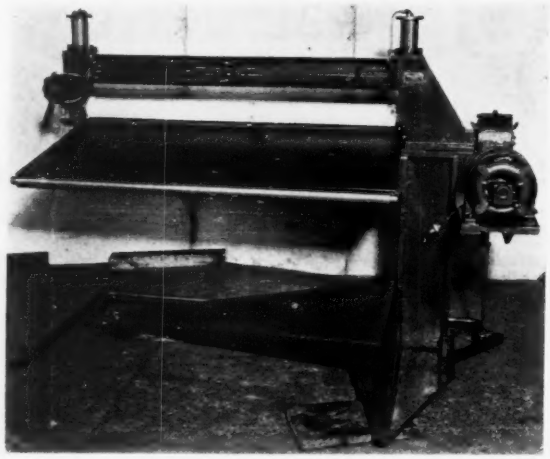

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U. S. Crude and Waste Rubber Imports for 1941*

	Plantations	Latex	Paras	Africans	Centrals	Guayule	Totals 1941	Totals 1940	Balata	Miscellaneous	Waste
Jan. .....tons	82 095	3,046	646	655	99	292	86,833	72,520	73	870	85
Feb.	70,335	1,968	656	535	170	309	73,973	43,088	82	709	66
Total 2 mos., 1941 .....tons	152,430	5.014	1,302	1,190	269	601	160,806	.....	155	1,579	151
Total 2 mos., 1940 .....tons	109,194	4,226	959	614	104	511	.....	115,608	182	964	275

Compiled from The Rubber Manufacturers Association, Inc., statistics.

United States Latex Imports

Year	Pounds (d.r.c)	Value
1938	26,606,048	$ 4,147,318
1939	61,460,003	10,467,552
1940	75,315,775	14,543,975
1941		
Jan.	4,892,860	1,019,741

Data from Leather and Rubber Division, Washington, D. C.

Growth of United States Rubber Manufacturing Industry, 1849-1939*

Year	Establishments	Average Number of Earners	Annual Wages	Value of Products	Rubber Consumption (Long Tons)
1849.....	36	2,602	$544,236	$3,039 735	1,000
1859.....	37	3,047	858,062	5,945,710	1,500
1869.....	56	6,025	2,559,877	14,566,374	3,756
1879.....	104	11,789	4,051,431	25,309 648	7,500
1889.....	167	20,152	9,526,909	42,853,817	14,960
1899.....	301	36,566	15,426,573	99,880 693	20,308
1904.....	265	43,873	20,084,166	148,015,391	26,089
1909.....	267	49,264	25,136,976	197,394,638	39,789
1914.....	342	74,022	44,167,402	300,993,796	62,265
1919.....	477	158,549	193,763,089	1,138,216,019	215,000
1921.....	496	103,273	123,612,873	704,903,133	177,772
1923.....	529	137,863	182,084,056	958 517,634	319,422
1925.....	530	141,869	191,285,520	1,260,805,063	388,481
1927.....	516	141,997	198,073,743	1,225,077,114	373,000
1929.....	525	149,148	207,305,857	1,117,460 252	467,400
1931.....	453	99,259	112,596,379	614,265,307	355,193
1933.....	408	106,283	99,116,552	472,743,587	412,365
1935.....	466	114,681	133,715,235	677,659,111	491 544
1937.....	477	129,601	170,775,281	882,538,514	543,600
1939†.....	595	120,715	161,409,811	902,328,802	592,000

*Reprinted from "The Index," XX, 2, 41 (1940), covering years 1849 to 1937 only. All data are not exactly comparable, owing to changing schedules of the Bureau of the Census and to changes in the industry, but it is believed that general trends are accurate.
†Data added from 1939 Census of Manufactures.

Rubber and Canvas Footwear Statistics

	Thousands of Pairs		
	Inventory	Production	Shipments
1938	16,183	50,812	54,942
1939	16,388	60,612	60,377
1940	11,129	57,278	62,480
1940			
Jan.	15,018	5,044	6,389
Feb.	15,319	5,062	4,761
Mar.	15,656	4,869	4,532
Apr.	16,881	5,128	3,902
May	18,095	5,075	3,862
June	18,886	4,528	3,737
July	17,641	3,323	4,567
Aug.	16,386	4,583	5,808
Sept.	14,232	4,046	6,200
Oct.	13,365	5,105	5,971
Nov.	11,878	5,146	6,633
Dec.	11,129	5,369	6,118

The above figures have been adjusted to represent 100% of the industry based on reports received which represented 81% for 1936-37.
Source: *Survey of Current Business*, Bureau of Foreign & Domestic Commerce, Washington, D. C.

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ALL CLASSIFIED ADVERTISING MUST BE PAID IN ADVANCE

GENERAL RATES	SITUATIONS WANTED RATES	SITUATIONS OPEN RATES
Light face type $1.00 per line (ten words)	Light face type 40c per line (ten words)	Light face type 75c per line (ten words)
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Allow nine words for keyed address. *Replies forwarded without charge*

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PRACTICAL RUBBER CHEMIST, 12 YEARS' EXperience compounding and processing for tires, mechanical and proofed goods, involving natural rubber and all synthetics. Also experienced with latex, airfoam sponge, and dipped goods. Ph.D. Have held supervisory positions. Location immaterial. Address Box No. 230, INDIA RUBBER WORLD.

RUBBER CHEMIST AND PRODUCTION MAN, WITH OVER 20 years' experience in general rubber and synthetics, their processing and compounding, wringer rolls, mechanical goods, also large rolls for every purpose, except typewriter. Wide experience in proofed goods. Capable of handling men. Address Box No. 232, care of INDIA RUBBER WORLD.

CHEMIST, 15 YEARS' EXPERIENCE IN COMPOUNDING, DEvelopment, and production of tires, tubes, camel back, repair materials, and mechanical rubber. Also experienced in factory control and management. Address Box No. 233, care of INDIA RUBBER WORLD.

YOUNG MAN, EXPERIENCED IN RESEARCH AND FACTORY processing of rubber and synthetic materials. Now holds responsible position, desires change. Address Box No. 234, care of INDIA RUBBER WORLD.

RUBBER ENGINEER WISHES NEW POSITION. COMPETENT superintendent or production manager, development supervisor, factory costs and specifications, compounder, laboratory control technician. 20 years of experience manufacturing mechanical, sponge and synthetic rubber goods. Expert in using reclaims. Address Box No. 237, care of INDIA RUBBER WORLD.

SUPERINTENDENT AND DEVELOPMENT ENGINEER DESIRES to make a change. 28 years' experience manufacturing all kinds of rubberized fabrics, spread and calendered, thoroughly understanding compound formulas and cost systems. Location immaterial. Address Box No. 238, care of INDIA RUBBER WORLD.

CHEMIST—YOUNG, PROGRESSIVE, ABLE COMPOUNDER. Thorough practical production experience with calendered, sheeted, molded goods, synthetics, sponge and latex. Plan, supervise production, handle help. Available short notice. Address Box 241, care of INDIA RUBBER WORLD.

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FACTORY SUPERINTENDENT—EXPERIENCED IN rubber and synthetic rubber—mechanical goods—coated fabrics. Technical training helpful—must be aggressive and resourceful with a record of accomplishment and available at once. Location near New York City. Unusual opportunity for the right man. State all qualifications, references, and salary desired. Enclose photograph. Address Box No. 240, care of INDIA RUBBER WORLD.

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FOR SALE AT HUDSON, MASSACHUSETTS: RUBBER FACTORY equipped for manufacturing rubberized fabrics. Address Box No. 235, care of INDIA RUBBER WORLD.

COMPLETE TIRE RETREADING PLANT FOR SALE, CONTAINing 9 molds: 4 passenger molds and 5 truck tire molds. If party not able to make full cash purchase, will be willing to sell cash and notes. Might also be interested in working out partnership arrangement. Address Box No. 239, care of INDIA RUBBER WORLD.

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Our staff of chemists, engineers and bacteriologists with laboratories for analysis, research, physical testing and bacteriology are prepared to render you *Every Form of Chemical Service*

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An International Standard of Measurement for

Hardness ● Elasticity Plasticity of Rubber, etc.

Is the DUROMETER and ELASTOMETER (23rd year)

These are all factors vital in the selection of raw material and the control of your processes to attain the required modern Standards of Quality in the Finished Product. Universally adopted.

It is economic extravagance to be without these instruments. Used free handed in any position or on Bench Stands, convenient, instant registrations, fool proof.

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Agents in all foreign countries.

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Green Chromium Oxides
Green Chromium Hydroxides

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Washed and Dry, Ready for Compounding
PLANTATION RUBBER
From Our Own Estates in Sumatra
CONTINENTAL RUBBER COMPANY OF NEW YORK
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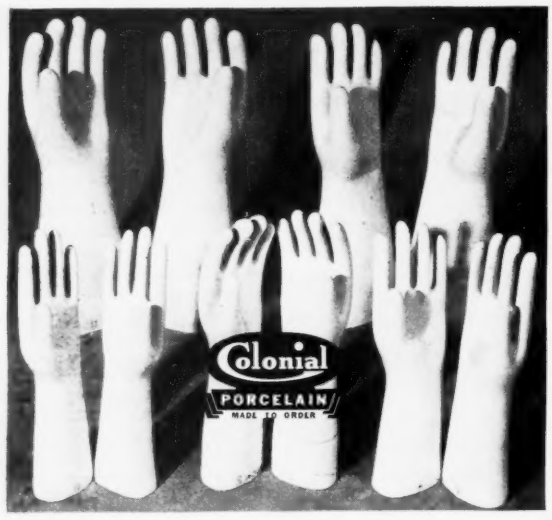
CROWN CLAY

SOUTHEASTERN CLAY COMPANY
AIKEN, SOUTH CAROLINA

(*Advertisements continued on page* 95)



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—for dipped rubber gloves, including linemen's or electricians' gloves, surgeons' and household gloves. Some are made from our own stock molds and others from customers' molds.

Write today for our new catalog covering rubber glove and other forms for dipped rubber goods. Prompt attention given to requests for quotations based on your specifications or stock items.

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MOST *Effective*

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Chemically pure, stable, inert.

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The Chemical & Pigment Company

Baltimore, Md. • Collinsville, Ill. • Oakland, Calif.

Manufactured by

American Zirconium Corporation

Baltimore, Maryland

World Net Imports of Crude Rubber—Long Tons

Year	U.S.A.	U.K.†	Argentine	Australia	Belgium	Canada	France	Greater Germany‡	Italy	Japan	Poland	Sweden	U.S.S.R.	Rest of World	Total
1938	406,300	168,172	7,700	12,300	11,300	25,700	58,100	107 900	28,200	46,300	7,900	8,300	26,800	49,200	928,000
1939	486,348	112,249¶	9,600	15 400	9,600	32,500	33,751§	62,344§	12,582§	42,300	5,415§	7,965a	14,000*	61,866	603,842¶
1940															
Jan.	71,541	....	1,049	921	891	5,047	....	....	....	4,547	....	....	....	....	....
Feb.	41,797	....	565	1,846	694	3,508	....	....	....	5,243	....	....	....	....	....
Mar.	58,283	....	756	1,784	....	3,062	....	....	....	6,057	....	....	....	....	....
Apr.	70,135	....	606	1,612	....	3,096	....	....	....	2,000*	....	....	....	....	....
May	50,621	....	589	2,128	....	3,108	....	....	....	2,500*	....	....	....	....	....
June	53,266	....	543	1,181	....	1,062	....	....	....	3,000*	....	....	....	....	....
July	69,374	....	783	1,902	....	5,112	....	....	....	3,000*	....	....	....	....	....
Aug.	72,612	....	767	2,508	....	4,605	....	....	....	4,500*	....	....	....	....	....
Sept.	78,126	....	1,216	2,485	....	2,743	....	....	....	....	....	....	....	....	....
Oct.	74,400	....	1,000*	590	....	8,336	....	....	....	....	....	....	....	....	....
Nov.	72,775	....	1,181	1,350	....	5,451	....	....	....	....	....	....	....	....	....
Dec.	97,794	....	....	721	....	7,437	....	....	....	....	....	....	....	....	....

*Estimated, and to Aug. 31 1939, only. †U. K. figures show gross imports, not net imports. ‡Including imports of Austria and Czechoslovakia. ¶Up to Aug. 31, 1939, only. §Up to July 31, 1939, only. aUp to Sept. 30, 1939. Source: *Statistical Bulletin of the International Rubber Regulation Committee*

Shipments of Crude Rubber from Producing Countries—Long Tons

Year	Malaya including Brunei and Labuan	N.E.I.	Ceylon	India	Burma	North Borneo	Sarawak	Thailand	French Indo-China	Total	Philippines and Oceania	Liberia†	Nigeria (incl. Brit. Cameroons)	Other Africa	South America	Mexican Guayule	Grand Total
1938	372,000	298,100	49,500	8,500	6,700	9,500	17,800	41,600	59,200	862,900	2,000*	2,900	3,100	5,900*	15,300	2,800	894,900
1939	376,800	372,000	61,000	9,200	6,600	11,900	24,000	41,800	65,200	968 500	2,100*	5,400	2,800	6,600*	16,100	2,900	1,004,400
1940	540,417	537,733	88,937	13,649	9,668	17,623	35,166	43,940	64,437	1,351,570	2,300*	7,223	2,703*	7,200*	17,601	4,007	1,392,604
1940																	
Jan.	26,229	54,148	7,698	839	833	1,858	2,256	5,722	5,238	104,821	185	1,191	147	600	1,550	389	108,883
Feb.	45,651	37,958	8,946	2,030	892	1,164	2,678	4,307	6,931	110,557	94	477	234	600	1,662	239	113,863
Mar.	47,885	42,355	5,305	1,070	871	1,050	3,526	3,111	3,551	108,724	178	548	343	600	1,482	346	112,221
Apr.	24,607	44,416	4,144	817	990	1,799	2,951	1,834	2,927	84,485	203	598	120	600	1,159	317	87,482
May	57,874	40,436	7,337	972	1,046	1,370	2,696	2,582	4,578	118,891	195	364	361	600	2,305	331	123,047
June	45,471	44,834	5,603	841	712	1,421	4,077	2,178	2,730	107,867	168	405	127	600	1,080	101	110,348
July	42,861	60,482	7,330	884	310	1,767	2,494	4,253	4,045	124,426	169	342	298	600	1,035	443	127,313
Aug.	45,872	46,631	8,139	994	75	1,593	2,640	4,545	7,337	117,776	285	308	328	600	1,233	327‡	120,857
Sept.	58,892	44,024	9,985	1,258*	61	1,743	2,404	3,247	9,303	130,917	100	323	145	600	1,295	349‡	133,729
Oct.	52,767	50,139	8,127	1,332*	509	1,693	2,564	3,355	2,082	122,568	275	1,024	200*	600	1 860	381‡	126,908
Nov.	36,045	36,985	5,623	1 331*	1,295	1,137	3,360	3 463	6,715	95,954	248	830	200*	600	1,513	392‡	99,737
Dec.	56,263	35,325	10,700	1,331*	2 074	1,028	3,520	5,343	9,000	124,584	209	813	200*	600	1,427	392‡	128,216
1941																	
Jan.	37,804	58,926	7,866	1,479*	955	2,085	2,445	2,137	9,058	122,755	250*	750*	200*	600	2,103	250*	126,908

* Estimated. †Guayule rubber imports into U.S.A. provisional until export figures from Mexico are received. Source: *Statistical Bulletin of the International Rubber Regulation Committee.*

Classified Advertisements

Continued

MACHINERY AND SUPPLIES FOR SALE

SCOOP! 4—84" Heavy Duty Mills, complete; 1—60" several smaller sizes; 1—Farrel 24"x24" 12-deck Hydraulic Press, 15" ram; 12—24"x48" Hydraulic Presses, 14" ram; 7—Triplex Hydraulic Pumps, 18 to 35 GPM, 1500 to 3000 lbs. per sq. in.; also Mills, Calenders, Tubers, etc. CONSOLIDATED PRODUCTS CO., INC., 13-16 Park Row, New York, N. Y.

FOR SALE: 2—U. S. BUREAU OF STANDARDS DYNAMOMETER Tire Testing Apparatus; 1—Two-Roll Water-Cooled Rubber Mill, 6" & 8" dia. x 9" face; 75-foot Link Belt Conveyer, 36" wide. Hydraulic Presses, Pumps, and Accumulators, Rubber Mills, etc. Send for latest bulletins. We buy your surplus equipment. STEIN EQUIPMENT CORP., 426 BROOME ST., NEW YORK CITY.

THROPP MILL AND CALENDER FOR SALE: ALmost new. Both motor driven. Size Mill 16" x 42"; Three-Roll Combination Calender, 14" x 36". May be seen by appointment. UNIVERSAL PLASTICS CORP., New Brunswick, N. J.

CALENDER—FARREL, 3-ROLL STOCK AND FRICTION, 24" x 66", complete with bed plate, frames, boxes, gears, but without motor or reduction gear. Excellent condition. Address Box No. 231, care of INDIA RUBBER WORLD.

MACHINERY AND SUPPLIES WANTED

WANTED FOR USER: 1——NO. 3 or NO. 9 BANBURY MIXER; 3—Mills; 1—Calender; 5—Hydraulic Presses, with pumps and accumulators; 2—Tubers. No dealers. Address Box No. 236, care of INDIA RUBBER WORLD.

SPECIALIZING IN **USED MACHINERY** FOR THE **RUBBER** AND ALLIED INDUSTRIES
ERIC BONWITT — AKRON, OHIO

HYDRAULIC VALVES

Operating, Globe, Angle, or Check Valves—Hydraulic Presses, Accumulators, Pumps, etc. —For almost any size or pressure.
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New Rubber Spreaders, Churns, Pony Mixers, Saturators.
Used — Rebuilt — Rubber — Chemical — and Paint Machinery.
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Sponge Rubber: Sheeted—Die Cut—Molded
We Solicit Your Inquiries
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SANDUSKY, OHIO

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Rand. REG. U. S. PAT. OFF.
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DRESS SHIELDS
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SOLE PRODUCERS
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GUARANTEED REBUILT MACHINERY
IMMEDIATE DELIVERIES FROM STOCK
MILLS, CALENDERS, TUBERS
VULCANIZERS, ACCUMULATORS
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HYD. PRESSES, PUMPS, MIXERS
CUTTING MACHINES, PULVERIZERS
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FACTORY REBUILT and GUARANTEED RUBBER MILL MACHINERY
Accumulators Mills Churns Spreaders
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"Equipped to Furnish Complete Plants"
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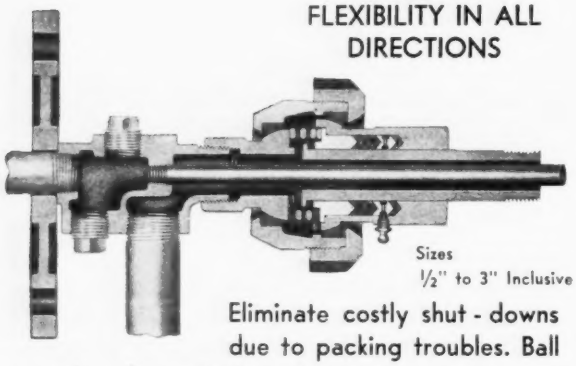
For water cooling or heating of TUBERS, MILLS, AND CALENDERS

BARCO REVOLVING JOINTS

FLEXIBILITY IN ALL DIRECTIONS



Sizes ½" to 3" Inclusive

Eliminate costly shut-downs due to packing troubles. Ball seats relieve friction from piping strains on rotating sleeve. Send for catalog 292.

BARCO MANUFACTURING COMPANY
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In Canada — The Holden Co., Ltd.

SCHUSTER CALENDER GAUGE

. . . IT CAN NOW BE EQUIPPED WITH AUTOMATIC CONTROL

NEW — and more valuable than ever. For the past 13 years The Schuster Calender Gauge has proven itself an outstanding and indispensable instrument in the rubber industry. *Now* it automatically adjusts your rolls to a predetermined thickness and correctly maintains that thickness. Coatings for tire fabric and similar uses are kept accurate and uniform *automatically*. The result is a better product at a lower cost. Write us today for complete particulars.

THE MAGNETIC GAUGE COMPANY
60 EAST BARTGES STREET AKRON, OHIO
Eastern States Representative—
BLACK ROCK MANUFACTURING CO., Bridgeport, Conn.

Dominion of Canada Statistics

Imports of Crude and Manufactured Rubber

	January, 1941		January, 1940	
UNMANUFACTURED	Quantity	Value	Quantity	Value
Crude rubber, etc.....lb.	13,522,707	$2,733,673	11,259,546	$2,263,930
Latex (dry weight).....lb.	566,882	166,613	45,681	17,287
Gutta percha .....lb.	3,448	815	.....	.....
Rubber, recovered.....lb.	987,500	59,513	1,121,700	62,999
Rubber, powdered, and gutta percha scrap .....lb.	408,800	9,973	601,200	11,933
Balata .....lb.	4,461	839	.....	.....
Rubber substitute .....lb.	32,600	10,472	30,700	10,848
Totals	15,526,398	$2,981,898	13,058,827	$2,366,997
PARTLY MANUFACTURED				
Hard rubber comb blanks...	.....	$4,187	.....	$1,358
Hard rubber, n. o. s.....lb.	4,420	3,766	2,300	1,931
Rubber thread not covered.lb.	3,282	2,497	4,467	4,722
Totals	7,702	$10,450	6,767	$8,011
MANUFACTURED				
Bathing shoes .....prs.	2,710	$474	144	$27
Belting	.....	13,751	.....	9,697
Hose	.....	43,599	.....	15,042
Packing	.....	7,144	.....	6,826
Boots and shoes.....prs.	91	54	657	297
Canvas shoes with rubber soles .....prs.	1,060	370	1,320	350
Clothing, including waterproofed	.....	3,829	.....	2,179
Raincoats .....no.	1,733	3,964	502	2,945
Gloves .....doz. prs.	587	1,269	674	2,682
Hot water bottles.....	.....	247	.....	826
Liquid rubber compound....	.....	2,833	.....	13,541
Tires, bicycle .....no.	736	764	4,755	2,562
Pneumatic .....no.	992	16,988	1,600	17,892
Solid for automobiles and motor trucks .....no.	37	1,007	68	1,653
Other solid tires.....	.....	2,208	.....	1,068
Inner tubes .....no.	686	1,878	904	2,046
Bicycle .....no.	1,375	290	4,835	946
Mats and matting.....	.....	9,828	.....	8,104
Cement	.....	8,080	.....	11,060
Golf balls .....doz. prs.	714	1,552	958	1,683
Heels .....prs.	6,452	321	2,723	171
Other rubber manufactures..	.....	223,620	.....	153,967
Totals	.....	$344,070	.....	$255,564
Totals, rubber imports..	.....	$3,336,418	.....	$2,630,572

Exports of Domestic and Foreign Rubber Goods

UNMANUFACTURED	Produce of Canada Value	Reexports of Foreign Goods Value	Produce of Canada Value	Reexports of Foreign Goods Value
Waste rubber	$17,589	.....	$8,558	.....
MANUFACTURED				
Belting	$28,519	.....	$51,719	.....
Bathing caps	77	.....	.....	.....
Canvas shoes with rubber soles	22,142	.....	32,052	.....
Boots and shoes	92,871	.....	727,822	.....
Clothing, including waterproofed	19,306	.....	31,969	.....
Heels	838	.....	4,727	.....
Hose	269,160	.....	55,195	.....
Soles	1,023	.....	5,184	.....
Soling slabs	212	.....	2,074	.....
Tires, pneumatic	343,031	.....	636,529	.....
Not otherwise provided for	9,422	.....	.....	.....
Inner tubes	42,564	.....	46,420	.....
Other rubber manufactures..	25,657	.....	49,772	.....
Totals	$854,822	.....	$1,643,463	.....
Totals, rubber exports...	$872,411	.....	$1,652,021	.....

Imports by Customs Districts

	January, 1941 *Crude Rubber		January, 1940 *Crude Rubber	
	Pounds	Value	Pounds	Value
Massachusetts	15,854,542	$2,799,824	13,401,326	$2,257,118
New York	134,163,861	23,970,149	104,858,076	18,162,197
Philadelphia	1,873,912	318,293	8,496,266	1,307,071
Maryland	20,998 480	3,626,664	12,317,960	2,041,299
Virginia	.....	.....	22,432	4,038
Georgia	1,260,400	225,492	.....	.....
Mobile	2,381,383	414,041	215,000	30,517
New Orleans	3,512,210	599,940	6,038,973	1,020,776
Galveston	89,600	14,470	101,137	18,535
Laredo	502,800	53,001	.....	.....
El Paso	44,800	4,637	43,000	4,223
Los Angeles	13,370,354	2,383,358	13,727,819	2,362,495
San Francisco	422,778	78,889	1,261,780	207,371
Oregon	29,344	5,282	.....	.....
Ohio	1,734	311	1,851,086	331,122
Colorado	.....	.....	56,217	8,367
Totals	194,506,198	$34,494,351	162,391,072	$27,755,129

*Crude rubber including latex dry rubber content.

TIRE MOLDS

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machined in a large modern shop at low prices by specialists in the field. We also build special machinery to your drawings.

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Original Producers of
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Directly from SEA WATER

A dependable source of supply for
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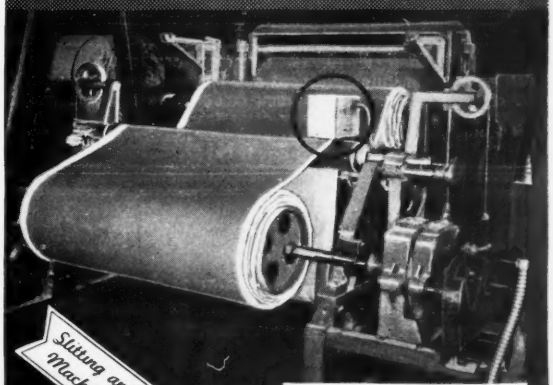

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Carbon Black
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Stocks of above carried at all times

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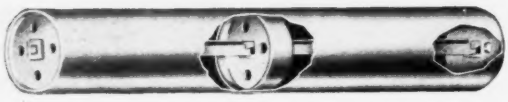

4" 5" 6" 8" 10" 12" diameters, any length.
Besides our well known Standard and Heavy Duty Constructions, we can supply light weight drums made up to suit your needs.
THE W. F. GAMMETER COMPANY
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Universally approved testing

*Scott Tester methods of testing and of expressing the results, are recognized as standard by Governments, Societies and technicians the world around.

SCOTT TESTERS

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HENRY L. SCOTT CO., Providence, R. I.

United States Statistics

Imports for Consumption of Crude and Manufactured Rubber

	December, 1940 Quantity	December, 1940 Value	Twelve Months Ended December, 1940 Quantity	Twelve Months Ended December, 1940 Value
UNMANUFACTURED—*Free*				
Liquid latex (solids)..... *lb.*	7,915,666	$1,539,957	75,686,916	$14,593,466
Telutong or pontianak..... *lb.*	2,467,921	341,876	16,690,113	2,449,137
Balata ..... *lb.*	121,110	39,471	1,451,681	300,500
Gutta percha ..... *lb.*	865,616	187,094	5,273 642	1,004,885
Guayule ..... *lb.*	623,000	62,586	8,139,421	758,007
Scrap and reclaimed ..... *lb.*	783,864	20,098	9,095,367	182,290
Totals	12,777,177	$2,191,082	116,337.140	$19,288,285
Misc. rubber (above), 1,000 *lbs.*	12,277	$2,191,082	116,337	$19,288,285
Crude rubber .....1,000 *lbs.*	210,945	36,369,973	1,749,036	303,117,726
Totals .....1,000 *lbs.*	223,722	$38,561,055	1,865,373	$322,406,011
Chicle, crude ..... *lb.*	2,245,827	$841,247	12,416,327	$4,239,431
MANUFACTURED—*Dutiable*				
Rubber tires ..... *no.*	2,043	$7,075	38,730	$212,866
Rubber boots, shoes and overshoes ..... *prs.*	4,498	711	121,602	30,441
Rubber soled footwear with fabric uppers ..... *prs.*	111,987	19,500	1,364 839	256,508
Golf balls ..... *no.*	3,600	547	570,850	54,209
Lawn tennis balls..... *no.*	14,400	1,466	923,121	90,519
Other rubber balls..... *no.*	214 088	1,710	2,075,159	51,427
Other rubber toys.....	.....	406	.....	22,130
Hard rubber combs..... *no.*	.....	.....	.....	.....
Other manufactures of hard rubber	.....	97	.....	1,845
Friction or insulating tape.. *lb.*	2,010	607	59 836	38,015
Belts, hose, packing, and insulating material.....	.....	14,476	.....	91,263
Druggists' sundries of soft rubber	.....	669	.....	30,726
Inflatable swimming belts, floats, etc. ..... *no.*	34,008	3,124	472,663	32,746
Other rubber and gutta percha manufactures	.....	15,229	.....	361,689
Totals	.....	$65,617	.....	$1,274,384

Exports of Foreign Merchandise

RUBBER AND MANUFACTURES				
Crude rubber ..... *lb.*	460,201	$94,422	15,813,730	$3,147,136
Balata ..... *lb.*	33,488	14,862	419,660	137,250
Other rubber, rubber substitutes and scrap ..... *lb.*	1,398	420	174,761	24,363
Rubber manufactures (including toys)	.....	35,038	.....	71,359
Totals	.....	$144,742	.....	$3,430,108

Exports of Domestic Merchandise

RUBBER AND MANUFACTURES				
Reclaimed ..... *lb.*	1,434,340	$73,703	25,408,295	$1,279,823
Scrap ..... *lb.*	9,459,357	161,057	93,639,958	1,610,775
Cements ..... *gal.*	31,605	32,773	405,079	498,544
Rubberized auto cloth. *sq. yd.*	17,347	9,001	257,071	114,101
Other rubberized piece goods and hospital sheetings. *sq. yd.*	256,533	137,257	2,440,418	1 115,162
Boots ..... *prs.*	4,361	10,089	101,749	215,869
Shoes ..... *prs.*	7,760	7,753	166,971	120,611
Canvas shoes with rubber soles ..... *prs.*	29,995	22,875	571,644	450,719
Soles ..... *doz. prs.*	3,704	6,768	43,930	89,923
Heels ..... *doz. prs.*	26,491	16,012	317,924	176,092
Soling and top lift sheets.. *lb.*	14,202	4,809	558,651	115,438
Gloves and mittens.. *doz. prs.*	6,836	17,639	100,891	241,371
Water bottles and fountain syringes ..... *no.*	46,111	15,016	355,245	121,535
Other druggists' sundries....	.....	78,524	.....	847,182
Gum rubber clothing.... *doz.*	19,158	29,910	224,716	468,999
Balloons ..... *gross*	32 819	22,891	271,146	230,305
Toys and balls	.....	16,940	.....	240,986
Bathing caps ..... *doz.*	1,285	2,172	48,979	85,587
Bands ..... *lb.*	12,209	5,695	182,906	86,201
Erasers ..... *lb.*	19,750	9,772	241,778	134,089
Hard rubber goods				
Electrical battery boxes. *no.*	15,644	11,936	256,564	183,432
Other electrical ..... *lb.*	82,114	16,581	585,039	196,051
Combs, finished ..... *doz.*	17,596	9,483	222,979	128,972
Other hard rubber goods....	.....	18,141	.....	176,543
Tires				
Truck and bus casings.. *no.*	62,094	1,465,151	594,824	15,069,910
Other auto casings..... *no.*	32,173	416,712	505,659	5,767,117
Tubes, auto ..... *no.*	73,000	203,176	855,253	2,236,637
Other casings and tubes.. *no.*	13,787	64,149	136,459	1,044,783
Solid tires for automobiles and motor trucks..... *no.*	1,791	31,612	6,913	132,610
Other solid tires..... *lb.*	5,540	2,059	354 500	65,479
Tire sundries and repair materials ..... *lb.*	192,010	55,377	2,609.487	764,497
Rubber and friction tape.. *lb.*	52,762	15,799	705,505	202,321
Fan belts for automobiles. *lb.*	26,567	15,725	376,156	204,808
Other rubber and balata belts ..... *lb.*	150,083	89,526	3,082,037	1,635,452
Garden hose ..... *lb.*	51,798	12,839	856,048	177,317
Other hose and tubing.... *lb.*	1,071,890	432,374	9,030,547	3,750,784
Packing ..... *lb.*	122,687	51,770	1,518,823	709,476
Mats, matting, flooring, and tiling ..... *lb.*	152,538	21,921	1,298,538	176,930
Thread ..... *lb.*	39,542	32,779	645,248	485,097
Gutta percha manufactures. *lb.*	9,582	4,426	1,112,937	349,362
Latex (d.r.c.) and rubber sheets processed for further manufacture ..... *lb.*	597,012	115,291	1,627,232	394,109
Other rubber manufactures..	.....	208,600	.....	2,315,862
Totals	.....	$3,976,083	.....	$44,410,861